



The impact of the ECB's PEPP project on the COVID-19-Induced crisis in the corporate bond market

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ARTICLE INFO

JEL Classifications:

E52

E58

G12

Keywords:

COVID-19

Quantitative easing

Liquidity crunch

Financial crisis

PEPP

ECB

ABSTRACT

We examine the financial crisis in the European corporate bond market following the COVID-19 pandemic and assess the effectiveness of the ECB's QE program, PEPP, in mitigating it. Using credit (Z-spread) and liquidity (scaled bid-ask spread) spreads, we find that the crisis elevated Z-spreads of corporate bonds and mostly raised the bid-ask spread of ineligible bonds – indicating that the pre-pandemic QE shored up the liquidity of eligible bonds. Moreover, ineligible bonds issued by firms in COVID-19 hard-hit industries experienced the steepest increase in the credit and liquidity spreads. The results show that PEPP decreased the credit spreads of ineligible bonds via the portfolio rebalancing channel, especially in pandemic-sensitive industries; however, it did not improve corporate bonds' liquidity conditions.

1. Introduction

The COVID-19 pandemic sparked a financial crisis in 2020 that increased concerns over firms' debt defaults and bankruptcies. In response, the ECB introduced the Pandemic Emergency Purchase Programme (PEPP), a €750 billion sovereign and corporate bond purchase scheme, in an emergency meeting on March 18th, 2020, to ease the adverse effects of the pandemic on financial markets and the economy – an economic environment that previous QEs did not face. Hence, we investigate the transmission of the crisis on European non-financial corporation (NFC) bonds, the effectiveness of the ECB's policy announcements in mitigating the liquidity and credit crises, and the heterogeneity response of bonds to the pandemic and policies.

Research on the ECB's pre-pandemic corporate bond purchases shows the CSPP improved liquidity and lowered NFCs' credit spread and their overall debt costs (Todorov (2020), and Cohen (2022)); Rischen and Theissen (2021) found it reduced the underpricing of bonds in the primary market. The purchases of sovereign debt, the PSPP, first announced in 2015, lowered government bond yields (De Santis (2020); Lemke and Werner (2020)), and encouraged bond issuance (Grosse-Rueschkamp et al., (2019), and Arce et al., (2021)). Moreover, the PEPP also alleviated financial stress in the sovereign bond market (Havlik

et al., (2022); Moessner and de Haan (2022); Carnazza and Liberati (2021); Lang and Schadner (2021); Fendel et al., (2021); Ortman and Tripiet (2021); Broeders et al., (2023)).

Our study complements Demirgüç-Kunt et al., (2023), who investigated PEPP's initial impact on corporate risk premia. They found that its announcement improved firms' equity returns and CDSs in countries that provided fiscal support amidst the crisis. We expand the tested timeframe to analyze the lasting heterogeneous effect of PEPP and the crisis, examine the ECB's March 12th policy announcement, test PEPP's impact on bonds' liquidity, and utilize different measurements for credit risk.

The COVID-19 crisis prompted a "dash for cash" across major financial markets (Arteaga-Garavito et al., (2023)), leading other central banks to intervene: Gilchrist et al., (2020), O'Hara and Zhou (2021), Chen et al. (2021), Kargar et al., (2021), Haddad et al., (2021), and Boyarchenko et al., (2022) investigate U.S. corporate bond market liquidity during the pandemic and show that the Fed's QE announcements to acquire corporate bonds, stabilized financial conditions. Nozawa and Qiu (2021) find a heterogeneous reaction to the Fed's policy announcements in credit spreads but limited evidence to support the liquidity channel. In the UK, Fatouh et al., (2021) found that QE improved liquidity conditions in the repo market during the pandemic.

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<https://doi.org/10.1016/j.econlet.2024.111563>

Received 16 November 2023; Received in revised form 17 January 2024; Accepted 20 January 2024

Available online 21 January 2024

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Table 1
Descriptive statistics of the daily data.

Panel A: Daily Variables of Euro bonds												
Eligible Bonds	Min		Max		Median		Mean		Std. Dev.		Bond -Day Obs.	
January, 2 – April,20 2020	Non-Covid	Covid	Non-Covid	Covid	Non-Covid	Covid	Non-Covid	Covid	Non-Covid	Covid	Non-Covid	Covid
Z-spread	0.03	0.05	1911.09	2637.32	55.8	57.34	80.79	98.02	84.64	119.15	59,051	19,126
Bid-ask spread	1.36	1.27	3694.34	1186.65	44.85	40.47	48.69	49.9	38.21	41.94	59,199	19,163
Ineligible Bonds	Min		Max		Median		Mean		Std. Dev.		Bond -Day Obs.	
January, 2 – April,20 2020	Non-Covid	Covid	Non-Covid	Covid	Non-Covid	Covid	Non-Covid	Covid	Non-Covid	Covid	Non-Covid	Covid
Z-spread	0.01	12.68	2475	4978.75	139.5	143.76	218	287.84	274.4	425.52	19,646	6327
Bid-ask spread	2.51	1.71	1311.70	3110.80	57.44	65.93	81.13	118.41	91.13	190.34	19,865	6357
Panel B: Daily Variables of U.S. dollar bonds and Euro bonds (eligible bonds)												
	Min		Max		Median		Mean		Std. Dev.		Bond-Day Obs.	
January 2 – April 20, 2020	US Bonds	Euro Bonds	US Bonds	Euro Bonds	US Bonds	Euro Bonds	US Bonds	Euro Bonds	US Bonds	Euro Bonds	US Bonds	Euro Bonds
Z-spread	0.27	0.03	1602.42	2637.32	132.26	56.18	164.43	85.06	132.65	94.5	14,592	78,312
Bid-ask spread	0	1.27	1554.40	3694.34	27.31	40.94	37.39	48.98	36.09	39.16	14,906	78,362

We contribute to this body of research by focusing on the European bond market.

This letter demonstrates how the pandemic affected corporate debt markets and the transmission mechanism of QE to mitigate the crisis. It expands the existing literature on how QE's policy announcements impact corporate bonds' credit and liquidity risks amidst the pandemic and investigates the progressions of the pandemic and the policy announcements' heterogeneous effect on market expectations via the portfolio rebalancing channel.

The findings indicate that the crisis raised the credit spreads for eligible and ineligible bonds; however, it increased the liquidity risk of only ineligible bonds – especially covid-related firms; the pandemic had little effect on eligible bonds' liquidity risk – indicating the QEs that were restarted before the crisis shored up their liquidity. The ECB's March 12th announcement did not improve financial conditions. This lackluster result could be attributed to the ECB President's statement.¹ Finally, PEPP lowered the credit spreads of bonds, mainly of ineligible bonds in the covid sector, and led to a rise in bond issuances in the primary market. However, unlike previous QEs, PEPP was ineffective in mitigating the liquidity crunch at the height of the crisis.

2. Data and methodology

Our study used Bloomberg² to gather secondary market corporate bonds data (excluding financial, non-profit, and government firms) to analyze the impact of the CSPP and PEPP³ on European NFC bonds from January 2nd to April 20th, 2020. The sample was divided into eligible and ineligible bonds.

We analyzed the Z-spread changes in abnormal returns for credit

spread and the scaled bid-ask spread⁴ for liquidity.⁵ We collected daily data on European NFCs' 1761 bonds, including 1341 bonds' Z-spreads and scaled bid-ask spreads, of which 1046 bonds are QE-eligible (eligible) and 295 bonds are not (ineligible). The U.S.-denominated bonds are of European firms with at least one eligible bond for 420 bonds. Table 1 presents the daily figures.⁶

We examine the announcement's impact on market expectations by creating dummy variables⁷ for each event. Other central banks' policies, macroeconomic variables, and time to maturity are controlled.⁸

Bonds were divided between those issued by firms in sectors hard-hit by the pandemic (covid firms/sectors) and those not (non-covid firms/sectors). The former includes a dozen sub-sectors, e.g., airlines and hotels.⁹

A difference-in-difference (DiD) methodology is used. We executed a propensity score matching test (Appendix F) to validate DiD's unrelated intervention assumption, which confirms that the control and the treatment groups' behavior was indistinguishable pre-crisis.

The Generalized Method of Moments first difference (linear) panel model (first-difference GMM) regression addresses potential endogeneity and serial correlation issues.

We estimate the regression as in Eq. (1):

$$y_{i,t} = \alpha_{i,f} + \beta y_{i,t-1} + \gamma \left(Control_i * Event(t)_{i,t} \right) + \delta \left(Treatment_i * Event(t)_{i,t} \right) + \delta X1_{i,t} + \theta X2_{i,t} + \varepsilon_{i,t} \quad (1)$$

$y_{i,t}$ is a bond i 's Z-spread abnormal returns and scaled bid-ask spread (level) at time t . $\alpha_{i,f}$ is the individual (bond) fixed effect for the country, credit rating, and industry. $Treatment_i$ stands for eligible bonds (1 for eligible bonds and 0 otherwise). $Control_i$ stands for ineligible bonds (1

¹ The ECB President responded to a question regarding the rise in Italian sovereign bond yields by stating the bank's role is not "to close spreads" when asked about rising sovereign bond spreads – which may have countered the ECB's efforts to ease markets' financial stress. <https://www.ecb.europa.eu/press/pressconf/2020/html/ecb.is200312~f857a21b6c.en.html>.

² The data include only bonds with more than 90% available data during the sampled period and a Bloomberg Valuation (BVAL) Score of 6 or higher. Data comprise closing values (end of the trading day). The BVAL Score evaluates securities' price accuracy based on Bloomberg's calculations with a Score range from 1 to 10. Scores above 6 are considered reliable.

³ For a discussion on bond purchases conditions see Appendix A.

⁴ The spread between the bid and ask prices (daily closing values) divided by its mid-price or $(BA = \frac{Ask - Bid}{Mid})$. For our analysis, we used its level data.

⁵ See Appendix B for the list of variables.

⁶ We divided the descriptive statistics into eligible, ineligible, Euro-denominated, and U.S. dollar-denominated bonds.

⁷ The variable equal to 1 for the event and onward, and zero otherwise. See Appendix C for the list of dates tested.

⁸ We also control for industry, country of origin, and credit rating. For the sample's breakdown based on country, industry, and credit rating, see Appendix D.

⁹ See Appendix E for a more detailed breakdown and explanation for the division between covid and non-covid sectors.

Table 2

February 17th to April 20th, 2020 Dependent Variables	Euro Bonds		Euro & U.S. Bonds	
	Z-Spread	BA	Z-Spread	BA
	Ab. (1)	Spread (2)	Ab. (3)	Spread (4)
Crisis March 4 X Control	21.86*** (0.00)	15.83*** (0.00)	9.59*** (0.00)	16.53*** (0.00)
Crisis March 4 X Treatment	3.70*** (0.01)	0.37*** (0.00)	3.41*** (0.00)	0.58*** (0.00)
March 12 (APP) X Control	54.58*** (0.00)	25.31*** (0.00)	13.74*** (0.00)	24.30*** (0.00)
March 12 X Treatment	7.71*** (0.01)	0.31*** (0.01)	10.09*** (0.00)	3.63*** (0.00)
March 19 (PEPP) X Control	-98.82*** (0.01)	1.11*** (0.00)	-0.86*** (0.00)	1.61*** (0.00)
March 19 X Treatment	-1.88*** (0.01)	3.93*** (0.01)	-9.55*** (0.01)	5.61*** (0.00)
Industry & Credit & Country Fixed effects	Yes	Yes	Yes	Yes
Observations (Bond-Days)	51,517	51,148	48,680	57,537
No. of Bonds	1288	1279	1217	1439
Serial correlation test AR2 (1)	0.93	0.50	0.99	0.33
Hansen test (2)	0.09	0.45	0.40	0.13

*, **, and *** indicates statistical significance of 10 %, 5 % and 1 %, respectively.

for ineligible bonds and 0 otherwise). We include two control groups: Euro-denominated bonds issued by European firms that were ineligible¹⁰ and U.S. dollar-denominated bonds issued by European firms with at least one eligible bond.

We included the latter to affirm our model selection and provide an additional perspective on the covid shock and policy response. Since they have the same credit risk as eligible Euro-denominated bonds, the price difference depends on the bond market's currency risk characteristics of each economic block and monetary policy.

$Event(t)_{i,l}$ is composed of several dummy variables for specific dates.¹¹ $X1_{i,t}$ includes time to maturity of bond i and corporate-related data such as EBIT-to-revenue, debt-to-asset, and log of assets as of Q4 2019. $X2_{j,t}$ is a vector of macroeconomic variables j : Euro/USD changes, Stoxx-600, 3-month German bund yield, high and low spreads of Stoxx-600 and 10-year German bund yield, Ted spread, 10-year Treasury yield, and liquidity swaps. By adding U.S.-related variables, we aim to control possible spillover from the Federal Reserve's policies.

We divide the sample into covid firms (treatment group) and non-covid firms based on the same framework in Eq. (1) to investigate the heterogeneity of bonds' reactions.

3. Results

Section 3.1 presents a baseline analysis and compares eligible bonds to U.S. dollar-denominated bonds of eligible under CSPP/PEPP and Euro-denominated ineligible bonds. Section 3.2 examines the impact on covid sectors relative to non-covid sectors.

3.1. Baseline analysis

The results are in Table 2.¹²

We used Euro-denominated bonds in the first two columns to compare eligible to ineligible bonds. Columns (3) and (4) compare Euro-

¹⁰ E.g., bonds with a non-investment credit rating or maturity higher than 31 years.

¹¹ The complete list is in Appendix C.

¹² The results show that the estimated models are not subject to a serial correlation of order two. The penultimate rows report AR2's p-values of the Hansen test. They indicate the instruments used are valid for the serial correlation test in the first-differenced residuals of Eq. (1).

Table 3

February 17th to April 20th, 2020 Dependent Variables	Treatment Bonds		Control Bonds	
	Z-Spread	BA	Z-Spread	BA Spread
	Ab. (1)	Spread (2)	Ab. (3)	(4)
Crisis March 4 X Non-COVID	3.19** (0.00)	5.02*** (0.00)	2.09*** (0.00)	-11.36*** (0.00)
Crisis March 4 X COVID	0.59*** (0.00)	-1.69*** (0.00)	133.50*** (0.00)	55.06*** (0.00)
March 12 (APP) X Non-COVID	4.52*** (0.00)	4.66*** (0.00)	17.37*** (0.00)	-34.81*** (0.00)
March 12 X COVID	19.10*** (0.00)	0.30*** (0.01)	41.66*** (0.00)	164.78*** (0.01)
March 19 (PEPP) X Non-COVID	-12.43*** (0.01)	1.92*** (0.00)	1.61*** (0.01)	7.76*** (0.00)
March 19 X COVID	-9.82*** (0.01)	9.97*** (0.02)	-132.33*** (0.01)	-3.30*** (0.01)
Credit & Country & Industry Fixed effects	Yes	Yes	Yes	Yes
Observations (Bond-Days)	41,800	41,748	36,540	27,349
No. of Bonds	1045	1044	914	684
Serial correlation test AR2 (1)	0.48	0.85	0.62	0.32
Hansen test (2)	0.43	0.57	0.34	0.05

*, **, and *** indicates statistical significance of 10 %, 5 % and 1 %, respectively.

denominated to U.S. dollar-denominated bonds.¹³

The Crisis raised the credit spreads of eligible and ineligible bonds but only the liquidity spread of ineligible bonds. The ECB's March 12th event did not improve market conditions. The ECB President's comments on widening sovereign bond spread, compounded with the WHO declaring a global pandemic on March 11th, has eclipsed the policy announcement.

Following the PEPP announcement, the Z-spread of ineligible bonds plummeted by 98.8 bp or 20 % (Appendix G shows the breakdown by percentage changes). PEPP did not affect the Z-spread of U.S. dollar-denominated bonds, indicating that it did not spill over to European firms' bonds in U.S. markets. PEPP did not reduce bid-ask spreads. When comparing PEPP to CSPP, the latter effectively reduced credit and liquidity spreads (Todorov (2020) and Cohen (2022)), while the former only reduced credit spreads.

The improved credit conditions coincided with a rise in bond issuance following the PEPP announcement¹⁴ – especially for eligible bonds (this finding coincides with Todorov (2020), who found that eligible bonds issuance rose by 25 % after the CSPP announcement) and bonds issued by covid firms.

As a robustness test, we conducted a regression analysis until May 11th¹⁵ to confirm our conclusions.

3.2. Heterogeneity analysis

The results are in Table 3.

For eligible bonds, the crisis raised the Z-spread of non-covid (column 1) by 3.2 bp, and the bid-ask spreads by five bp. Whereas, covid firms' liquidity and credit spreads remained nearly flat.

The crisis did not raise eligible bonds' bid-ask spreads (column 2) – which could be attributed to the pre-pandemic QEs that shored up their liquidity.

¹³ The U.S. dollar-denominated bonds were issued by European NFCs with eligible bonds.

¹⁴ See Appendix H for a more detailed explanation of the data.

¹⁵ See Appendix I.

The pandemic mainly affected ineligible bonds issued by covid firms (columns 3 and 4): Their Z-spread spiked by or by 133.5 bp or 42.9 % (see Appendix J), and the bid-ask spread by 55 bp or 95 %; it had nearly no adverse effect on non-covid firms' spreads.

These results suggest a portfolio rebalancing process in which investors fled from ineligible bonds in the covid sector to eligible bonds in the covid sector or ineligible bonds in the non-covid sector.

Finally, the results demonstrate that PEPP did not improve liquidity conditions and mainly reduced credit spreads for eligible bonds (covid and non-covid firms), especially ineligible bonds issued by covid firms.

4. Conclusion

We examine the impact of the pandemic on European corporate bonds and the effectiveness of the ECB's policies in mitigating its effects. The crisis started as a credit risk event that escalated into a "dash for cash". In response, the ECB introduced PEPP to calm markets. The ECB's pre-crisis QEs mitigated most of the crisis's adverse effects on eligible bonds but not ineligible ones. PEPP reduced the credit spreads of bonds, mainly for ineligible bonds issued by covid firms, via the portfolio rebalancing channel. While previous research showed that QE improved bonds' liquidity, the results indicate that PEPP was ineffective at shoring liquidity amidst the crisis.

Data availability

The authors do not have permission to share data.

Acknowledgements

We thank the editor and an anonymous referee for their valuable comments. We also thank Yohay Elam for his helpful suggestions and appreciate participants' comments at the 2022 Royal Economic Society, 2021 Scottish Economic Society, 27th International Computing in Economics and Finance conferences, and the 2021 Macroeconomic Workshop at Cracow University. This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.econlet.2024.111563](https://doi.org/10.1016/j.econlet.2024.111563).

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