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The impact of QE on sovereign risk



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To support monetary transmission, the ECB has used asset purchases as market stabilization instrument. This has underpinned the low-risk status of EMU sovereign debt. Panel regression outcomes show that this market stabilization effect of QE lowered the effect of volatility on sovereign bond spreads in crisis-prone EMU countries significantly. We postulate that QE has features of a put option written by the ECB to protect bond holders against some tail risks. Simulations with a contingent claims model (CCM) show that this implicit put option is valuable to investors in sovereign bonds.

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Introduction

Since the Global Financial Crisis (GFC), central banks have used large scale asset purchase programmes to support price stability and to counter financial market stress. Many papers document the effects of these asset purchases on bond yields and credit spreads and relate these effects to the signaling, the duration extraction and the portfolio rebalancing channel. There is however less research about the effect of Quantitative Easing (QE) as backstop for tail risks in sovereign bond markets. Our study contributes to the literature by examining the effect of the backstop function of QE on bond market volatility and sovereign bond spreads.[1] This risk relates to sovereign default risk and disorderly market conditions, such as market illiquidity, fire sales and asset price volatility.

Over the last decade, the ECB has increasingly used QE as a market stabilization instrument to support monetary transmission. By acting as market-maker of last resort the central bank also changes the nature of sovereign risk. The central bank's backstop function namely removes some tail risks from the market. QE therefore has features of an implicit put option written by the central bank to investors. The option gives investors the right to sell sovereign bonds to the central bank in extreme market conditions. Such market conditions are usually induced by a shock that affects multiple countries in the EMU, such as the euro sovereign bond crisis in 2012 and the covid-19 pandemic in 2020. Consequently, the existence of the implicit put option will induce investors to change their expectations about the safety of sovereign bonds.

Our research question is to what extent the ECB's asset purchases have effectively lowered sovereign risk spreads of EMU countries through reducing the effect of volatility on sovereign spreads. We analyze this question through the lens of the credit risk extraction channel, for which we use the volatility of sovereign bond returns as an indicator. We focus on a number of key crisis-prone EMU countries, in particular Italy, Ireland, Spain, Portugal. These countries likely benefit more from the market stabilization effect of QE than less crisis-prone countries. The period that we research runs from 2000 until the end of 2021.

Our two-fold approach

We use two modelling approaches to examine the market stabilization effect of QE. Both approaches link volatility of sovereign bond returns to sovereign credit spreads. First, we estimate a panel regression model including macro-economic, financial market and monetary policy variables. To analyze to what extent QE affects the component of the credit spread that compensates investors for volatility, we interact the bond return volatility with dummy variables for the different QE programmes of the ECB: the Securities Markets Programme (SMP), Outright Monetary Transactions (OMT), the Public Sector Purchase Programme (PSPP) and the Pandemic Emergency Purchase Programme (PEPP). The programme dummies are 1 for the period since the ECB announced the programme until the end of it. We define the sovereign bond spread as the 10 year sovereign bond yield minus the risk-free rate for which we use the 10 years euro overnight index swap (OIS) rate. We control for other monetary policy measures by including the shadow rate and monetary surprise shocks, i.e. unexpected response of the risk-free rate to monetary policy decisions.

Second, as a complementary approach we use a structural credit risk model to assess the market stabilization function of QE on sovereign risk. The structural model is a *contingent claims model* (CCM) in which we postulate

[1] The full paper is available as working paper on SSRN:

Broeders, Dirk, Leo de Haan and Jan Willem van den End (2022), „How QE changes the nature of sovereign risk", https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4031646.

that QE features as a put option written by the central bank to bond holders which protects the latter against tail risk. It resembles the market stabilization function of QE, through which the central bank purchases bonds from investors in stressed market conditions that can affect sovereign risk of EMU countries. The CCM provides a framework to quantify the value of the market stabilization function of QE. An important parameter that determines this value (i.e. the value of the put option) is the return volatility of the underlying bonds. The strike price of the put option is equal to the level of senior sovereign debt.

The CCM is called the "Merton model" if it is applied to measure credit risk. The Merton model takes a balance sheet perspective and is based on three guiding principles: (i) the value of liabilities is derived from the values of assets; (ii) asset values follow a stochastic process, and (iii) different types of liabilities have different priority, i.e., senior and junior claims on the assets. We define junior sovereign debt to be equal to total sovereign debt held by domestic investors excluding domestic banks. This assumes that although the government may default on its domestic debt, it will try to avoid defaulting on the part held by domestic banks to prevent the banking sector from collapsing as a consequence. Further, we define senior sovereign debt to be equal to total sovereign debt, including bonds held by the central bank, plus the interest payments minus junior sovereign debt.

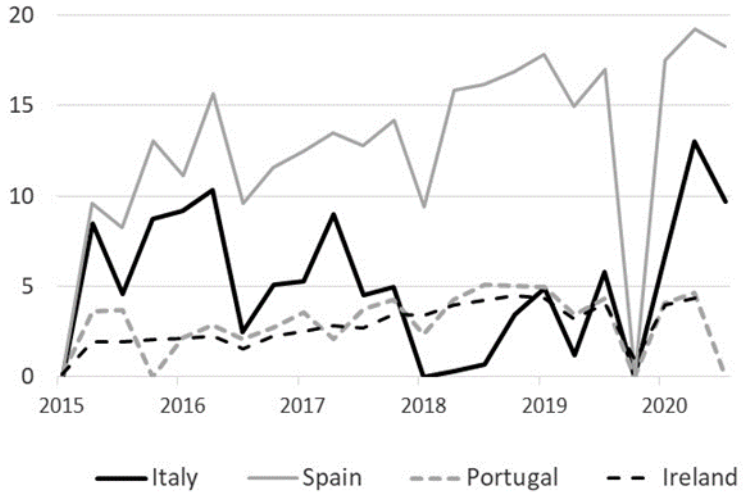
Key results

The outcomes of the panel regression show that the market stabilization effect of QE significantly lowered the spreads of the four EMU countries in our sample. Table 1 (see Annex) presents the estimated coefficients for the dummy variables for the SMP, OMT, PSPP and PEPP interacted with volatility. The market stabilization programmes SMP, OMT and PEPP reduced the effect of volatility on spreads most clearly, implying that the (upward) effect of bond return volatility on the spread was smaller during these specific programmes. A similar effect is not found for the regular bond purchases under the PSPP. To examine the effects of the flows of asset purchases on sovereign spreads, we also interacted the QE programme dummies with the flows of purchased sovereign bonds. The outcomes (not reported here) show that the SMP and PEPP contributed to lower spreads by the flow of bond purchases. The effect of purchase flows on spreads is not found to be significant for the PSPP. While the PSPP is not a market stabilization instrument, it has changed the character of the sovereign bond market through other channels, such as the duration extraction channel.

To gauge the underlying effect of QE on default risk and hence on the value of the put option, we perform a counterfactual simulation from 2015 onwards. In the counterfactual simulation we derive a shadow put value by assuming that the sovereign bond return volatility in 2015-2020 remained constant at the high level observed in 2015, the year in which the PSPP was introduced. The counterfactual therefore assumes that since 2015 there has been no volatility reducing effect of QE. The difference between the shadow put value and the actual put value then indicates the value of the central banks' commitment to support market stability, assuming that QE has reduced bond return volatility from 2015 onward. Equivalently it shows how valuable QE is to investors in sovereign bonds.

Figure 1 shows the difference between shadow put value and actual put value. A widening difference indicates that QE is valuable to investors. The difference clearly widened in 2015-2019, except for Italy. The return volatility of Italian sovereign bonds increased again in 2018 (by which the difference between the shadow and actual put value fell), even though the PSPP was active. The volatility spike at that time in Italy was triggered by idiosyncratic political turmoil. At the start of the covid19-pandemic (March 2020) the actual bond market volatility spiked again for all four countries and only declined after the PEPP programme was introduced. The decline of actual volatility in the remainder of 2020 and in 2021 widened the difference between the shadow and actual put again. This indicates that the market stabilization function of PEPP was valuable for investors in sovereign bonds.

Figure 1. Underlying value of QE reflected in put option value
(difference between shadow put value and actual put value, EUR bn)



Policy implications

In principle, the market stabilization function of QE is only needed in situations where the market fails to coordinate a good equilibrium. Our results can guide policymakers on the use of backstop facilities for sovereign bond markets in such conditions. The outcomes indicate that market stabilization programmes lower sovereign spreads by reducing the effect of bond market volatility. This will be welfare improving, provided that unintended side effects, such as moral hazard risk and reduced fiscal discipline, are mitigated by the design of the programme. These risks can for instance be avoided by relating the strike price of the central bank put option to the risk of disorderly market conditions.

Annex

Table 1. Estimation results for interaction terms. Dependent variable is Spread

	window 1..3 months	window 1..6 months	window 1..12 months	window 1..18 months
	(1)	(2)	(3)	(4)
Vol	0.100*** (0.008)	0.099*** (0.008)	0.091*** (0.008)	0.069*** (0.009)
Vol x SMP dummy	-0.034 (0.023)	-0.058*** (0.020)	-0.033** (0.016)	0.006 (0.010)
Vol x OMT dummy	-0.109*** (0.039)	-0.081*** (0.023)	-0.044*** (0.017)	-0.014 (0.012)
Vol x PSPP dummy	-0.082 (0.152)	-0.105 (0.134)	-0.116* (0.064)	-0.059 (0.045)
Vol x PEPP dummy	-0.122** (0.060)	-0.113*** (0.042)	-0.129*** (0.032)	-0.105*** (0.030)
Explanatory note. The QE programme dummies are 1 for the period since the ECB announced or introduced the particular programme (SMP: May 2010, OMT: July 2012, PSPP: January 2015, PEPP: March 2020). We estimate the model with different windows for the QE programme dummies, i.e. windows ending 3, 6, 12 and 18 months after the start of the programme, respectively. Fixed country effects included (not reported). Standard errors, robust to cross-sectional heteroskedasticity and within-panel serial correlation, within parentheses. ***, **, * denote *p*-values less than or equal to 1%, 5%, 10%, respectively.				

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