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147 Report by Franziska Bremus, Franziska Schütze, and Aleksandar Zaklan

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- Green bond market has grown strongly over the past years, especially in the euro area
- ECB bond purchases have improved financing conditions for corporate green bonds

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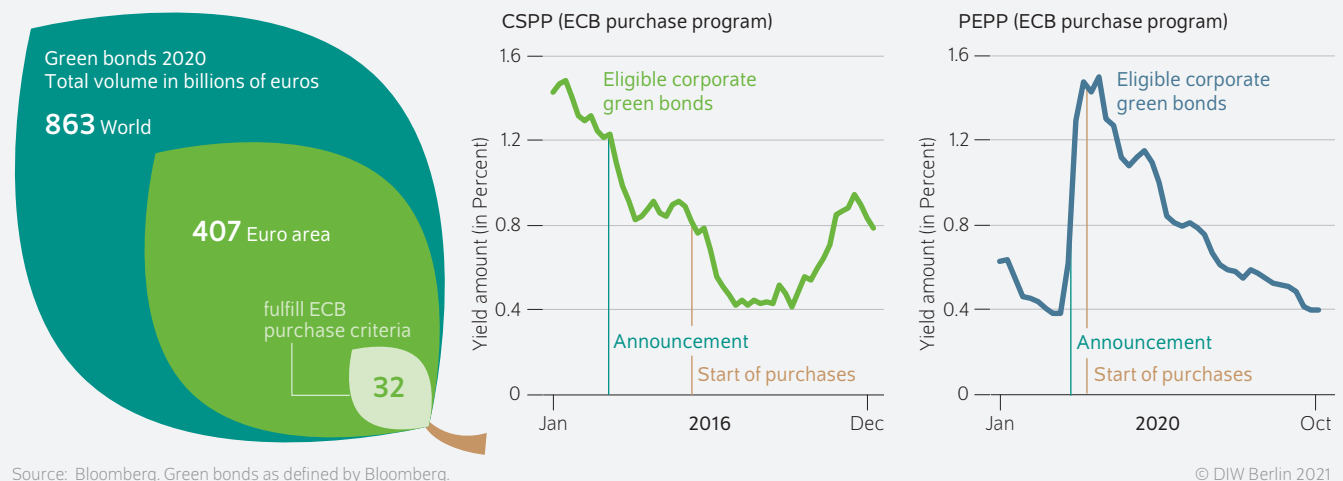
AT A GLANCE

ECB policy facilitating corporate financing in the green bond market

By Franziska Bremus, Franziska Schütze, and Aleksandar Zaklan

- Report analyzes evolution of the green bond market in the euro area and effects of the ECB's bond purchases
- Green bond market has grown strongly over the past years, especially in the euro area
- Comparison of the development of yields of bonds eligible and ineligible for purchase under the ECB programs
- ECB bond purchases have improved financing conditions for corporate green bonds
- Better inclusion of climate-related risks in credit ratings could further support the green bond market

ECB bond purchases improve financing conditions for firms in the growing green bond market



FROM THE AUTHORS

The ECB's monetary policy has a comparable effect on the young green bond market as it does on conventional bonds. For the ECB's purchase programs to be more sustainably oriented, climate-related risks should be considered more strongly in bond credit ratings."

— Franziska Bremus, study author —

MEDIA



Audio Interview with A. Zaklan (in German)
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ECB policy facilitating corporate financing in the green bond market

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ABSTRACT

The green bond market has grown strongly in recent years, especially in the euro area. With regard to the European Union's climate targets, it is likely that the demand for green bonds—bonds that specifically support sustainable projects—will continue to increase in the future. The European Central Bank (ECB) is buying green bonds as well and is planning to reorient its strategy towards more sustainability. This Weekly Report presents an empirical analysis of the evolution of the rapidly evolving green bond market. In addition, the effect of ECB bond purchases on yields under the corporate sector purchase program (CSPP) and the pandemic emergency purchase program (PEPP) is examined. The analysis shows that ECB bond purchases improve financing conditions also for corporate green bond issuers. One decisive criterion for whether a bond may be purchased by the ECB is its credit rating. Currently, the climate-related risks for firms are not sufficiently considered in credit ratings and the advantages of green bonds receive little attention compared to conventional bonds as a result. Improved mapping of climate-related risks into credit ratings would not only be important for market stability, but could also further improve financing conditions for green bond issuers.

The global green bond market has recently seen strong growth, rising from just under 45 billion euros in new issuance in 2015 to 237 billion euros in 2020.¹ The European market has played an important role in this development: In 2020, almost half of all new green bonds were issued in euro. While public sector bonds initially accounted for the majority of green bonds issued in euro, they have now been overtaken by corporate bonds. The share of new corporate green bonds issued in total corporate bonds issued increased from below 1 percent to 3.5 percent between 2016 and 2020.²

The ECB has become an important buyer in the European corporate bond market since the introduction of the corporate sector purchase program (CSPP) in 2016. This raises the question of which companies and sectors are benefiting particularly from ECB bond purchases. Initial studies show a relatively large share of bonds are from firms in emission-intensive sectors, such as the energy, transport, and automotive sectors.³

The ECB significantly expanded its bond purchase program once again over the course of the coronavirus pandemic with the pandemic emergency purchase program (PEPP), which includes both public sector and corporate bonds. As a result, there is a greater focus on the question of how transitioning to a low-emission economy and the ensuing corporate transition risks would affect the ECB's bond portfolio.⁴ With the political decision to transition to a carbon-neutral economy by 2050, many companies are facing changing market conditions. They are also facing increased investment needs, such as for changes in production processes due to new emission standards. For example, by transitioning to electromobility, the production plants of combustion engine manufacturers would lose value in the future if they cannot be used for

¹ Around 50 and 270 billion US dollars, cf. Climate Bond Initiative (available online; Accessed on March 22, 2021). This applies to all other online sources in this report unless stated otherwise.

² Bloomberg data, authors' own calculations.

³ For an initial analysis, cf. Sini Matikainen, Emanuele Campiglio, and Dimitri Zenghelis, "The climate impact of quantitative easing," Policy Paper, Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science (2017).

⁴ For a current analysis, cf. Yannis Dafermos et al., *Decarbonising is easy: Beyond market neutrality in the ECB's corporate QE* (London: The New Economics Foundation, 2020).

other purposes to the same extent. If the ECB does not take these risks into account when purchasing bonds, its portfolio could potentially suffer substantial value losses in the future. At the same time, the potential advantages of green bonds relative to conventional bonds are not considered.

The ECB is currently reviewing the climate and environmental risk management in various business areas as a part of its strategy revision.^{5,6} Its new strategy is expected in fall 2021.

This report first provides an overview of the growing green bond market before presenting an analysis of the effect of ECB corporate bond purchases on the financing conditions in this new market segment.⁷

Green bond market still modest but strongly expanding

Public and private sector issuers issue green bonds with the goal of financing climate-friendly projects.⁸ While the global green bond market is small compared to the conventional bond market, it has grown strongly over the past years. The world's first green bonds were issued by the European Investment Bank (EIB) and the World Bank in 2007 and 2008. In 2013, Gothenberg, Sweden, followed as the first city⁹ with an issuance volume of 57 million euros. *Electricité de France* (EDF, a French electricity producer)¹⁰ and *Vasakronan* (a Swedish real estate company)¹¹ were the first companies to issue green bonds, with issuance volumes of 1.4 billion and 145 million euros, respectively. In September and November 2020, the German Federal Government issued green sovereign bonds for the first time, totaling 11.5 billion euros¹² and making Germany one of the largest issuers of green bonds in 2020 alongside the US real estate financier Fannie Mae.¹³ According to data from Bloomberg, green corporate bonds accounted for less than one percent of all corporate bonds issued in 2016. By 2020, green corporate bonds made up 3.5 percent of all corporate bonds issued.

⁵ Cf. Franziska Bremus, Geraldine Dany-Knedlik, and Thore Schlaak, "Price stability and climate risks: sensible measures for the European Central Bank," *DIW Weekly Report* no. 14 (2020): 238–245 (available online; accessed on March 17, 2021) as well as the ECB's website (available online).

⁶ This includes banking regulation in addition to monetary policy strategy. In November 2020, the ECB published a guide on climate-related and environmental risks for banks (available online). It is planned that banks will conduct a self-assessment in 2021, which the ECB will review in 2022. At the same time, climate-related risks will be included in the 2022 stress test.

⁷ The empirical analysis is based on Franziska Bremus, Franziska Schütze, and Aleksander Zaklan, "The Impact of ECB Corporate Sector Purchases on Corporate Green Bonds," *DIW Discussion Paper* no. 1938 (2021) (available online).

⁸ Cf. Claudia Kemfert et al., "Green Finance – The Macro Perspective," *DIW Vierteljahreshefte für Wirtschaftsforschung* 88, no. 2 (2019): 5–10.

⁹ Cf. Climate Bonds Initiative (available online).

¹⁰ Cf. EDF press release from November 20, 2013 (in German; available online).

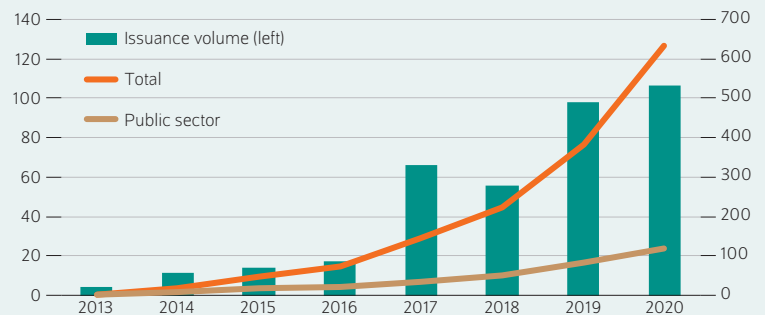
¹¹ Cf. John Hay, "Vasakronan issues 'first' corporate green bond," *Global Capital* from November 18, 2013 (available online).

¹² Cf. the website of the German Financial Agency (in German; available online).

¹³ Cf. Climate Bond Initiative, *Top 10 largest green bond issuers 2020* (available online).

Figure 1

Development of the European green bond market Left: billion euro; right: number of green bonds (new issues)



Notes: Green bonds issued in euro, the Bloomberg definition of green bonds used.

Sources: Bloomberg, authors' own calculations and depiction.

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The European green bond market has expanded significantly since 2016, primarily in the corporate bond sector (non-public sector).

Green bonds gaining in importance, especially in the euro area

According to the Climate Bonds Initiative, which developed a recognized standard for green bonds, the global green bond market reached a new high since data collection began in 2011 with an issuance volume of around 237 billion euros in 2020.¹⁴ Observing the size of the market shares by currency of issue shows that green bonds from the euro area, measured by cumulative issuance volume, currently make up the largest share of the global market. In the first half of 2020, its market share was around 40 percent of new issuances, followed by bonds in US dollars (34 percent) and in Chinese yuan (almost 10 percent).¹⁵ Since 2017, the annual issuance volume of green bonds in the euro area has grown faster than the rest of the global market.

Green bond data from Bloomberg show that both the number of green bonds issued in euro and the annual issuance volume have increased significantly in recent years (Figure 1). Accordingly, the number of green bonds in the euro area has risen at increasing speed, from three to over 600 since 2013. While green bonds were predominantly issued by public sector issuers at the beginning of the observation period, market growth was subsequently primarily driven by green corporate bond issuance. By 2020, bonds from private sector issuers (firms and financial institutions) made up more than 80 percent of the overall number of green bonds in the European market.

¹⁴ Cf. Climate Bonds Initiative (available online). Green bonds from the United States account for the largest share of these issues, followed by bonds from Germany, France, and China.

¹⁵ Cf. the website of the Climate Bonds Initiative, *Werte für 2020H1* (in German; available online).

As the number of green bonds increased, so has the issuance volume. While green bonds in the amount of just under five billion euros were issued in 2013, the volume was almost 20 times that at around 106 billion euros in 2020. At the end of 2020, the cumulative volume of euro-denominated green bonds was around 370 billion euro.

Green bonds are also issued in emission-intensive sectors

Over the period from 2013 to 2020, the public sector was the largest issuer of green bonds in euro (Figure 2) with an average market share of 42 percent, followed by financial institutions (26 percent). Green bonds were also issued in emission-intensive areas such as the utilities sector¹⁶ (20 percent) and the industrial sector (five percent). The sectoral perspective on the green bond market shows that emission-intensive economic sectors in particular, such as the utilities sector, play an important role for green bond issuers. Upon closer inspection, this is not surprising: It is precisely in these sectors where a great need for investment in decarbonization, and thus a high potential for green bonds, exists. According to EU Commission estimates, up to 235 billion euros in additional investments will be needed annually by 2050, the majority in the area of energy production, building refurbishment, and transport.¹⁷ Therefore, it is important to not only view the ECB bond purchases with regard to the sectoral distribution of the issuing firms, but also with regard to the share of green bonds. However, the certification of green bonds must be credible and transparent.¹⁸

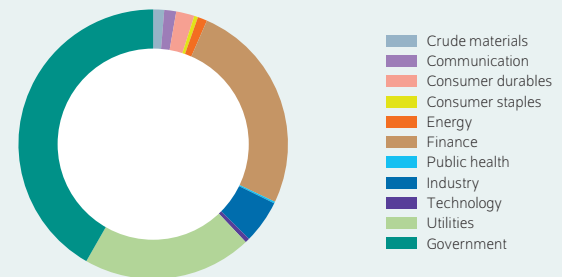
ECB purchases green bonds as a part of its bond purchase program

To support the economic recovery following the financial crisis of 2008/2009, the ECB purchased bonds from European issuers to a minor extent between 2009 and 2012. In 2015, the ECB began purchasing government bonds on a larger scale under the public sector purchase program (PSPP) (Figure 3). This was followed in March 2016 by what was at the time the world's largest corporate bond purchase program, the corporate sector purchase program (CSPP).

Corporate bonds must fulfill certain criteria to be eligible for purchase under the CSPP: First, the issuer may not belong to the financial sector and must be domiciled in a euro area country. Second, the bond must be issued in euro, have a remaining maturity of at least six months and a maximum

Figure 2

Market shares of green bond issuance volume by sector in the euro area In percent, 2013 to 2020



Notes: Sectoral classification according to the Bloomberg Industry Classification System (BICS), Level 1.

Sources: Bloomberg, authors' own calculations and depiction.

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In addition to the public sector (government), issuers from the financial and utilities sectors dominate the European green bond market.

remaining maturity of 30 years, and be rated investment grade (have a high credit rating) by at least one of the major rating agencies.¹⁹ If these requirements are met, the ECB may purchase conventional as well as green corporate bonds under the program. In accordance with the principle of market neutrality, the ECB has implemented these requirements from the very beginning.

In response to the coronavirus pandemic and the related economic uncertainties and restrictions, the ECB resumed purchasing additional corporate bonds in March 2020 under the PEPP program. The criteria for purchasing corporate bonds are the same as the CSPP criteria, with one major difference: Short-term bonds with a remaining maturity of at least 28 days may now be purchased as well. This also applies to green corporate bonds.

With the expansion of the green corporate bond market, the volume of green bonds meeting the purchase criteria has increased since the ECB began purchasing bonds.²⁰ For 2016, the underlying dataset contains only 25 green corporate bonds with an issuance volume of eight billion euros; in 2020, there were 149 titles with a total volume of almost 32 billion euro (Figure 4). This means that in 2020, just under 30 percent of euro-denominated corporate green bonds were in principle eligible for purchase by the ECB. This value—still low compared to conventional bonds—is due to many factors, among them the fact that the corporate bond purchase

¹⁶ The utilities sector includes electricity, water, and gas supply companies.

¹⁷ Cf. the EU Commission's impact assessment on stepping up Europe's 2030 climate ambition, Table 12, scenario including investments in the transport sector (available online).

¹⁸ Kapraun and Scheins (2019) show that the credibility of green bonds is an important factor for evaluating bonds, cf. Julia Kapraun and Christopher Scheins, "(In-)Credibly Green: Which Bonds Trade at a Green Bond Premium?" *SSRN Scholarly Paper* No. ID 3347337 (2019) (available online): Credibility can be guaranteed primarily by statutory minimum standards, external verification, and compliance verification. The EU Commission is currently working on a uniform standard for green bonds in the EU based on the EU taxonomy for sustainable economic activities. For further information on the EU taxonomy, cf. Franziska Schütze et al., "EU taxonomy increasing transparency of sustainable investments," *DIW Weekly Report* no. 51 (2020): 973–981 (available online).

¹⁹ Investment grade includes the ratings AAA to BBB- according to the scales of the rating agencies Standard & Poor's and Fitch.

²⁰ The significant increase in purchases of green bonds was a topic in an ECB bulletin, cf. Roberto A. De Santis et al., "Purchases of green bonds under the Eurosystem's asset purchase program," *ECB Economic Bulletin* 7 (2018) (available online).

Figure 3

Timeline of the ECB's bond purchase programs 2009–2020



Source: ECB press releases.

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The ECB has been purchasing bonds since 2009. In 2016, it purchased corporate bonds for the first time. In 2020, it began purchasing significantly more bonds again.

program does not cover green bonds from two important market actors, the public sector and financial institutions.²¹ In addition, about one-third of the green bonds issued by real-economy companies in this dataset do not have the necessary investment grade rating.

Yield development in different segments comparable before ECB market intervention

Using a difference-in-differences strategy (Box), the following section investigates if and to what extent the ECB bond purchase programs CSPP and PEPP affect the financing conditions on the green corporate bond market.²² To do so, a regression analysis is used to compare yields from green corporate bonds that are covered by the ECB purchase program with yields from euro-denominated green bonds that are not covered. Two control groups are used:²³

1. Green bonds issued by firms in the financial sector. These bonds are not eligible for purchase under the ECB programs because their issuers belong to the financial sector.
2. Green bonds issued by companies outside the financial sector that are not rated investment grade and therefore may not be purchased by the ECB.

Comparing average yields of eligible bonds with the control group shows that average yields of the treatment and control groups before the announcement of the CSPP and the PEPP, respectively, basically move in parallel. Thus, an essential requirement for a difference-in-differences analysis is fulfilled (Figure 5). Just before the CSPP announcement, the average yield of ineligible green corporate bonds was slightly below five percent due to their weaker credit rating, but significantly higher than the average yield of eligible green corporate bonds of just over one percent. In contrast, the yields of financial institutions' green bonds were at about 0.7 percent at the time of the CSPP announcement, lower than the yields of eligible green corporate bonds. It is observed that the yields of eligible green corporate bonds declined and converged with those of financial institutions both when the CSPP was announced in March 2016 and when purchases began in June 2016. This descriptive finding suggests that the ECB's additional demand for green bonds has improved the financing conditions for issuers of eligible bonds.

The difference in yields between corporate green bonds eligible for purchase under the PEPP compared to the same control groups at the time of the PEPP announcement in mid-March 2020 and of bond purchases that began immediately after at the end of March 2020 is qualitatively comparable to the situation in 2016. The average yields of non-eligible corporate green bonds are significantly higher than the yields of eligible corporate green bonds. The yields of financial green bonds, on the other hand, are lower. Unlike the earlier period, the shock to the bond markets due to the coronavirus pandemic is clearly visible. The PEPP was announced when many European countries, among them Germany, were enacting or announcing lockdowns in the

²¹ However, public sector green bonds can be purchased under the public sector purchase program (PSPP).

²² Cf. Bremus, Schütze, and Zaklan, "The Impact of ECB Corporate Sector Purchases on Corporate Green Bonds."

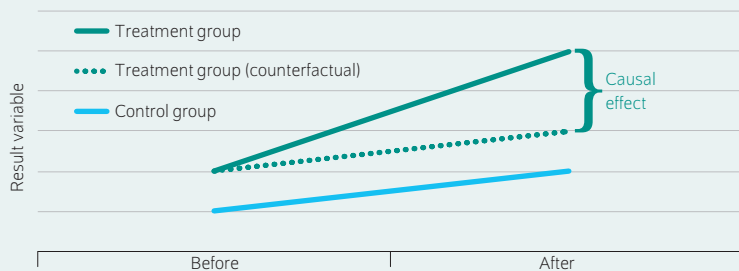
²³ Cf. Bremus, Schütze, and Zaklan, "The Impact of ECB Corporate Sector Purchases on Corporate Green Bonds," for a further analysis of two additional comparison groups, green bonds issued in either US dollars or Swedish krona.

Box

Difference in difference estimation

Figure

Difference-in-differences strategy for estimating the causal effect of a policy intervention



Source: Authors' own depiction.

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Using a difference-in-differences strategy, the causal effect of the ECB purchase programs on the yields of eligible green bonds can be estimated.

The estimation results presented in this Weekly Report are based on a difference-in-differences strategy. A difference-in-differences approach is an approximation of an ideal experiment using observational data. To analyze the effect of ECB bond purchases on the yields of eligible bonds, an ideal experiment would compare the yields of a group of eligible bonds with the yields of the same group

of bonds in a hypothetical scenario without the ECB purchase program. Since such an ideal experiment cannot be implemented in reality, empirical analyses must approximate the hypothetical (counterfactual) scenario of yields of eligible bonds without ECB programs. For this, the yields of bonds ineligible for purchase by the ECB but nevertheless comparable to eligible bonds are used.

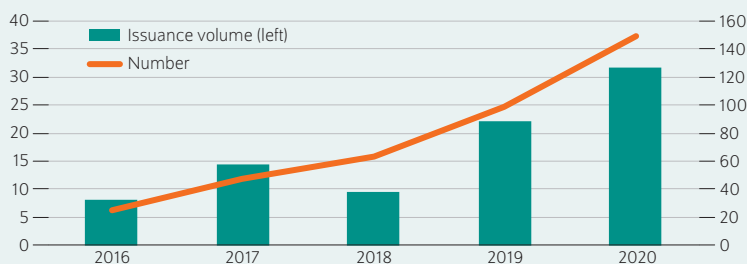
In the difference-in-differences strategy, two groups are compared: the treatment group and the control group. The treatment group is affected by an intervention, in this case by the announcement of one of the ECB purchase programs. The control group is not affected by political intervention and serves as an approximation of the treatment group in the hypothetical scenario that the intervention never took place. The admissibility of the selected control group is determined by the parallel development of yields in both groups before the ECB intervention.

The regression analysis as a part of the difference-in-differences strategy (Figure Box) determines the causal effect of the ECB purchase program as the difference between the differences in the yields of both groups before and after the announcement of the ECB program. The dashed line in the figure shows the hypothetical scenario—in this case, the hypothetical yields—of the treatment group without intervention. To approximate this hypothetical scenario of the treatment group, the control group is used. Here, the parallel development of trends between the two groups is decisive.

Figure 4

Development of the market for green bonds eligible for purchase by the ECB

Left: billions of euros; right: number of green bonds (new issues)



Notes: Green bonds issued in euros that are eligible for purchase by the ECB under the CSPP/PEPP. The Bloomberg definition of green bonds is used.

Sources: Bloomberg, authors' own calculations and depiction.

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Since 2016, increasingly more green corporate bonds are fulfilling the purchase criteria of the ECB programs. Overall, however, the volume remains limited.

wake of the first wave of the coronavirus. Average yields therefore increased rapidly in all three groups before decreasing again in April 2020.

ECB interventions lower yields of eligible green bonds

The empirical analysis of the yields of green bonds shows that the bond purchases by the ECB affected the financing conditions of eligible bonds. The CSPP and PEPP announcements lower yields of eligible green corporate bonds compared to ineligible green corporate bonds and thus improve the financing conditions of the underlying investment projects. This increases the attractiveness of the euro area as a future location for green bond issuers.

However, the effects of both ECB programs are heterogeneous. The CSPP has no significant effect on the yields of eligible corporate green bonds compared to ineligible green corporate bonds (Figure 6). In contrast, the CSPP reduces the average yields of eligible green corporate bonds compared to financial green bonds by around 30 basis points. This result suggests that investors have, at least in part, shifted their portfolios toward ineligible corporate bonds due to the ECB's additional demand for green bonds with high credit ratings—despite or precisely because of the higher risk

premiums (and thus yields) on these bonds.²⁴ This assessment is supported by a further analysis of the duration of the effect. No long-term effect of the CSPP on the yields of eligible corporate bonds relative to ineligible corporate bonds can be detected. In contrast, the yields of eligible corporate bonds compared to financial bonds remain noticeably lower for about six months after the announcement of the CSPP.²⁵ Overall, the results for green bonds point in a similar direction as the findings on the effect of the ECB bond purchases on conventional bond yields: Various studies show that after the CSPP announcement, the yields of eligible corporate bonds decline by 20 to 30 basis points compared to ineligible bonds.²⁶ Therefore, green bonds display market reactions that are comparable to conventional bonds—despite their small market share and special focus on sustainability.

The empirical analysis of the PEPP's effect on yields shows that the ECB's bond purchases in 2020 also improved the financing conditions of eligible green corporate bonds. For example, their yields fall by almost 80 basis points relative to ineligible corporate bonds due to the PEPP. This effect lasted for about six months following the announcement of the PEPP.²⁷ In contrast, the PEPP has no significant influence on yields of eligible green corporate bonds compared to green bonds from ineligible financial institutions. After the shock caused by the coronavirus pandemic, investors were probably less ready to shift their portfolio in favor of ineligible corporate bonds—green corporate bonds with a low credit rating—than when the CSPP was introduced.

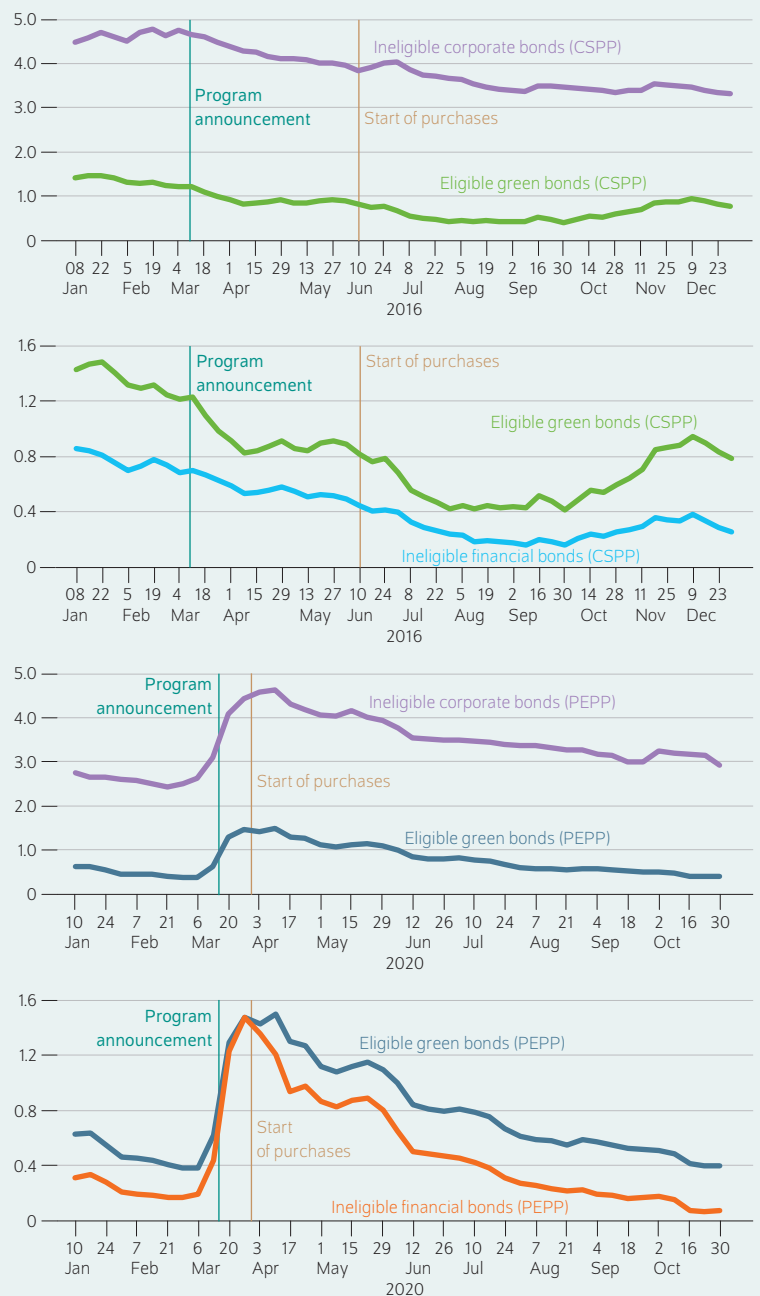
Overall, the results suggest that during the period of the CSPP's launch, green bond investors were willing to shift their portfolios to riskier green corporate bonds with lower credit ratings in the attempt to achieve higher yields.

This willingness was lower in 2020 against the backdrop of the coronavirus pandemic and investors tended to choose financial bonds, most of which had a high credit rating, as a fallback option following the start of the ECB purchases. Therefore, investors' desire for security is likely to have played a stronger role than attempts to achieve high returns in 2020.

Figure 5

Development of average yields, eligible and ineligible green bonds

In percent



Notes: Eligible bonds are green corporate bonds issued in euros with a high rating that are eligible for purchase under the CSPP/PEPP programs. The Bloomberg definition of green bonds is used.

Sources: Bloomberg; authors' own calculations and depiction.

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Until the ECB's intervention in the green bond market, the average yields of eligible and ineligible bonds were developing in parallel.

²⁴ For detailed information and results on portfolio rebalancing of investors after purchasing bonds from central banks, cf. for example Nordine Abidi and Ixart Miquel-Flores, "Who Benefits from the Corporate QE? A Regression Discontinuity Design Approach," *SSRN Scholarly Paper* No. ID 2914911 (2018) (available online), Arvind Krishnamurthy and Annette Vissing-Jorgensen, "The effects of quantitative easing on interest rates: Channels and implications for policy," NBER Working Paper No. 17555 (2011) (available online), and Andrea Zaghini, "The CSPP at work: Yield heterogeneity and the portfolio rebalancing channel," *Journal of Corporate Finance* 56 (2019): 282–297.

²⁵ Cf. Program, Schütze, and Zaklan, "The Impact of ECB Corporate Sector Purchases on Corporate Green Bonds,"

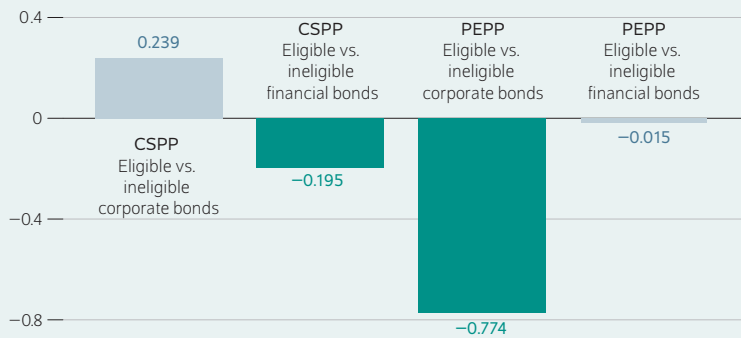
²⁶ De Santis et al., "The impact of the corporate sector purchase programme on corporate bond markets and the financing of euro area non-financial corporations," *Economic Bulletin Articles* 3 (2018) (available online); Karamfil Todorov, "Quantify the quantitative easing: Impact on bonds and corporate debt issuance," *Journal of Financial Economics* 135, no. 2 (2020): 340–358.

²⁷ Cf. Bremus, Schütze, and Zaklan, "The Impact of ECB Corporate Sector Purchases on Corporate Green Bonds,"

Figure 6

Effect of ECB bond purchase programs on the yields of green bonds

In percent



Notes: Estimated results of regression analyses of the effect of the CSPP/PEPP on yields of eligible green corporate bonds compared with two groups of ineligible green bonds issued. Green bars: statistically significant at the one per-cent level, gray bars: not statistically significant.

Sources: Bloomberg; authors' own calculations and depiction.

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ECB bond purchase programs cause the yields of green bonds to fall, especially under the PEPP.

Conclusion: ECB purchase programs make green bonds more attractive to issuers

This empirical study shows that the European green bond market has expanded significantly over the past years. Simultaneously, ECB purchase programs for corporate bonds have improved the financing conditions for corporate green bonds in the euro area. In this way, the European green bond market becomes more attractive to issuers. While the ECB's additional demand caused the yields of eligible corporate green bonds to decline in the months following the announcement of bond purchases, the yields of eligible and ineligible green bonds converge over time. The ECB's bond purchases have a positive effect on the financing conditions for green corporate bond issuers due to falling yields. At the

same time, the results suggest that in 2020, a year full of uncertainty, the desire for security played a greater role than attempts by investors to achieve greater yields.

The results also play an important role in the current discussion on a greener direction for the ECB's monetary policy. For the ECB, a reorientation toward greater sustainability should be accompanied by a re-evaluation of the creditworthiness requirements for eligible bonds. To avoid a loss of value in their purchased bonds due to an increase in defaults as climate-related risks become increasingly significant, the ECB should review their credit ratings, primarily for long-term green and conventional corporate bonds. Similar to the evaluation of climate-related risks for price stability and financial stability, it is also of great importance that these types of risks are adequately considered when evaluating bond credit ratings in regard to the ECB's bond purchases.²⁸ If the purchase criteria—or the requirements for rating agencies—were adjusted accordingly, a certain proportion of currently eligible conventional bonds could lose their eligibility if climate-related risks were adequately taken into account.²⁹ To support more accurate assessments of such risks, requirements for issuers to be transparent and disclose climate-related data, for example emission data and emission targets, should be included as an additional condition.³⁰ This is of great significance to both the ECB and other financial market actors when performing risk assessments for their investment decisions.

²⁸ The Task Force on Climate-related Financial Disclosures (TCFD) developed recommendations for climate-related information that should enable the financial sector to better understand its exposure to climate-related risks (available online).

²⁹ For detailed analyses and further policy recommendations, cf. Romain Svartsman et al., "Central banks, financial stability and policy coordination in the age of climate uncertainty: a three-layered analytical and operational framework," Climate Policy (2020) (available online), Dirk Schoenmaker, "Greening monetary policy," Climate Policy (available online), and Dafermos et al., *Decarbonising is easy*.

³⁰ The requirements for non-financial corporate reporting in the European Union are currently being revised, see NFRD guidelines (available online). The EU taxonomy for sustainable economic activities should also play an important role, cf. Schütze et al., "EU taxonomy increasing transparency of sustainable investments."

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