

DECARBONISING THE BANK OF ENGLAND'S PANDEMIC QE

'PERFECTLY SENSIBLE'

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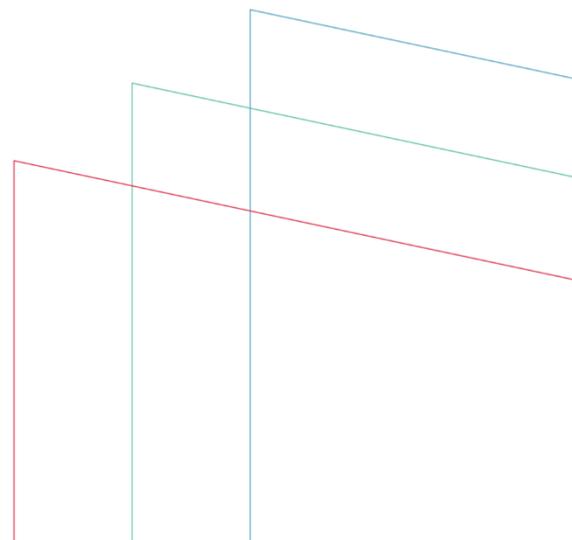
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EXECUTIVE SUMMARY

According to the new governor of the Bank of England, Andrew Bailey, aligning the Bank's corporate bond purchase scheme with the government's climate goals is a **'perfectly sensible thing to do'** and should be made a **'priority'**. Yet in its current framework, the pandemic corporate bond purchase programme is heavily biased towards carbon-intensive sectors – and thus at odds with the government's environmental objectives. This carbon bias means the programme may lower the cost of borrowing (an implicit subsidy) and encourage more debt issuance by the most carbon-intensive firms relative to low-carbon firms. To help support the governor's efforts, this briefing sets out two alternative purchase strategies – the 'Lower-carbon pandemic QE' scenario and the 'Low-carbon pandemic QE' scenario – that would help decarbonise the Bank's corporate bond purchases (boosting green investment in the process) and ensure that the Bank's policy interventions are consistent with its rhetoric.

1. INTRODUCTION

In March 2020, the Bank of England (BoE) announced new measures to support the UK economy in withstanding the COVID-19 crisis. The Bank committed to expand its Corporate Bond Purchase Scheme (CBPS) by a further £10bn, bringing the Bank's holding of sterling non-financial corporate bonds to £20bn. However, in its current guise, the CBPS is misaligned with the government's climate goals and implicitly creates better financing conditions for carbon-intensive economic activities. The CBPS biases the allocation of capital towards carbon-intensive sectors, while at the same time failing to reflect climate-related financial risks.

The CBPS is therefore not only at odds with government climate targets but also previous BoE climate commitments. Indeed, by its own admission the Bank has stated that CBPS is aligned with 3.5°C of warming by the end of the century.¹ Moreover, just two weeks before announcing the expansion of the CBPS, governor Andrew Bailey suggested that excluding fossil fuels and realigning the Bank's corporate bond portfolio with the government's climate goals is a 'perfectly sensible thing to do'.² More than ever, an alternative framework for the CBPS is both urgent and necessary – especially if the Bank plans to expand the CBPS in the future. As it stands, the CBPS is a missed opportunity to propel investments that are supportive of a green recovery and the transition towards a low-carbon economy.

To help the Bank align its purchases with national and international climate objectives and support a green recovery, we offer a framework that would reduce the carbon impact of the CBPS. We first show that carbon-intensive sectors are over-represented in the Bank's list of eligible bonds, despite their relatively lower contribution to UK employment and Gross Value Added (GVA). Then, we develop two scenarios for better climate alignment of the BoE's unconventional purchases.

The *Lower-carbon pandemic QE* scenario eliminates the bonds issued by the most carbon-intensive sectors and adds bonds that can be conducive to a greener economy, while still meeting the Bank's key eligibility criteria. The second, a fully *Low-carbon pandemic QE* scenario, eliminates the vast majority of bonds issued by all carbon-intensive sectors, adding bonds issued by sectors that are not carbon intensive. Both scenarios keep the volume of purchasable bonds at roughly the same level as in the Bank's original CBPS list, indicating that concerns about a potential lower aggregate stock of purchasable bonds are easily dismissed as grounds for not implementing these options.

2. IS THERE A CARBON BIAS IN THE BANK'S CORPORATE QE PROGRAMME?

The CBPS was first launched as part of a broader monetary stimulus package in August 2016. Corporate bond purchases would increase demand for such bonds and therefore reduce their yields. This in turn would lower the cost of borrowing, encouraging corporates to increase their investment beyond what it might otherwise have been. The programme also aimed to lower bond yields more broadly, through portfolio rebalancing.³ Overall the objective of these bond purchases was to bring inflation to target by increasing spending in the economy.

The Bank implements the corporate QE programme by first specifying a list of eligible bonds and then purchasing a portion of these eligible bonds. The purchases are made in a way that is intended to replicate the sectoral decomposition of the current bond market, in line with the 'market neutrality' principle. The Bank applies this principle by specifying the sector that each bond has been issued by (a nine-sector classification is used) and making purchases so that its aggregate holdings are representative of each sector's share. For example, as of July 1st 2020, 19% of eligible corporate bonds were classified under the 'electricity sector', accordingly 19% of the Bank's purchases are intended to be from the electricity sector.⁴

Table 1 shows the sectoral breakdown of the outstanding amount of corporate bonds (the amount of money corporates have borrowed via the bond market) that are included in the BoE's list of eligible bonds according to their NACE codes, which was announced on 4th June 2020. It maps this sectoral decomposition against the contribution of each sector in UK GHG emissions, UK employment and UK GVA. It is clear that *sectors with a high contribution to emissions are over-represented* in the BoE's eligibility list. Take two of the highest polluting sectors. 'Electricity, gas and steam and air conditioning supply' contributes only 0.4% to the UK employment and only 1.7% to the UK GVA, but accounts for 23.9% of the total eligible bonds. The purchasable bonds from the manufacturing sector correspond to 24.9% of the total eligible bonds, while the contribution of this sector to the UK employment and GVA is only 8% and 10.3% respectively.⁵

Table 1: Sectoral breakdown of the BoE list of eligible bonds (outstanding amount), UK greenhouse gas (GHG) emissions, UK employment and UK GVA

NACE code	Sector	BoE eligible bonds by amount outstanding (%)	Contribution to UK GHG emissions (%)	Contribution to UK employment (%)	Contribution to UK GVA (%)
A	Agriculture, forestry and fishing	0.1	12.3	1.2	0.6
B	Mining and quarrying	0.4	5.9	0.2	0.8
C	Manufacturing	24.9	19.7	8.0	10.3
D	Electricity, gas, steam and air conditioning supply	23.9	19.6	0.4	1.7
E	Water supply; sewerage, waste management and remediation activities	9.9	5.9	0.6	1.4
F	Construction	3.7	3.3	7.2	6.3
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	5.0	4.3	14.7	10.8
H	Transportation and storage	4.5	21.8	4.7	4.0
I	Accommodation and food service activities	0.5	0.9	6.6	2.7
J	Information and communication	12.7	0.4	4.5	6.6
K	Financial and insurance activities	0.3	0.0	3.3	7.1
L	Real estate activities	4.9	0.2	1.7	13.8
M	Professional, scientific and technical activities	1.9	0.6	8.0	7.7
N	Administrative and support service activities	3.8	0.9	8.4	5.0
O	Public administration and defence; compulsory social security	0.0	1.3	4.2	4.6
P	Education	1.3	0.7	8.3	5.8
Q	Human health and social work activities	2.0	1.6	12.4	7.4
R	Arts, entertainment and recreation	0.0	0.4	2.8	1.5
S	Other service activities	0.0	0.0	2.6	1.5
T	Activities of households as employers; undifferentiated goods & services producing activities of households for own use	0.0	0.0	0.2	0.3
Total		100.0	100.0	100.0	100.0

Sources: Bank of England (bond ISIN codes, as of 4 June 2020), TR Eikon (bond outstanding amount, June 2020), Eurostat (employment [2018], GVA [2016] and GHG emissions [2018])

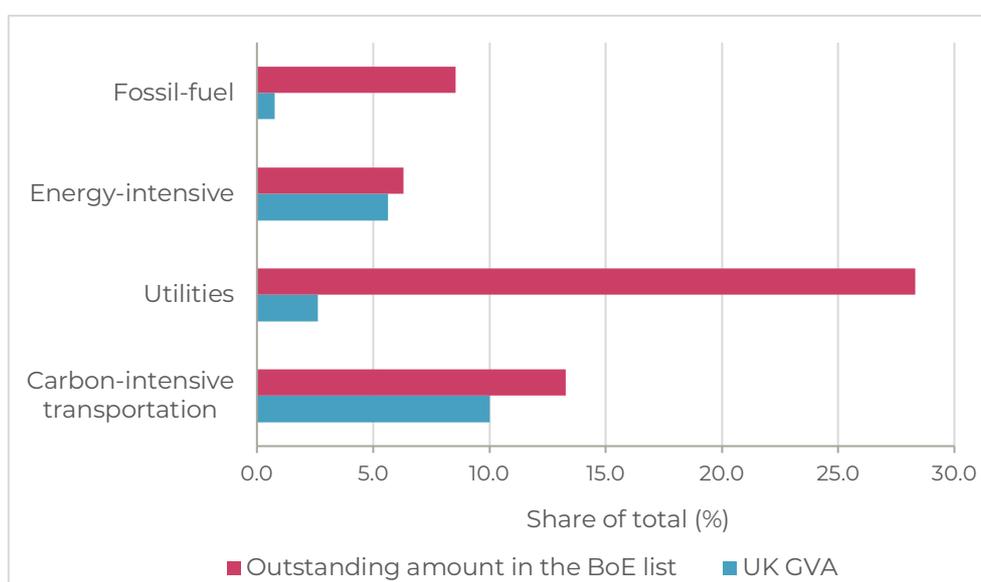
Using a more granular classification of sectors, we further confirm the carbon bias of the BoE list of eligible bonds. We identify four carbon-intensive sectors:⁶

- (a) Fossil fuel sectors that perform activities like the extraction of natural gas, the mining of hard coal and the manufacture of refined petroleum products;
- (b) energy-intensive sectors, most of which undertake manufacturing activities;

- (c) utilities that are involved for example in the production and distribution of electricity;
- (d) carbon-intensive sectors which are those sectors engaging in activities related primarily to car, air and sea transportation.

These sectors comprise approximately 57% of the value of the bonds that are part of the BoE list (amount outstanding),⁷ although their GVA share is only 19% (see Figure 1). Therefore, the sectoral allocation of purchases is inconsistent with sectoral make-up of the UK when it comes to GVA share and is considerably lopsided towards the most carbon-intensive sectors. The carbon bias also holds when we use the employment share instead of the GVA share.⁸

Figure 1: Carbon-intensive sectors in BoE list of eligible bonds and UK GVA



Sources: Bank of England (bond ISIN codes, as of 4 June 2020), TR Eikon (NACE 4-digit sectors and bond outstanding amount, June 2020), ONS, Annual Business Survey (GVA, 2018) and authors' calculations

Given the above, and since central banks purchase lowers bond yields (the cost of financing) of those companies that are eligible under the scheme,⁹ a likely unintended repercussion of the CBPS is a lower cost of borrowing and more debt issued by the most carbon-intensive firms relative to low-carbon firms. In effect, the most carbon-intensive companies are potentially indirectly subsidised by the Bank.

The structural carbon bias in the CBPS is not only at odds with the government's climate goals but fails to reflect the financial risks associated with the transition to a low-carbon economy. The CBPS is therefore inconsistent with the BoE's policy and messaging

surrounding high-carbon investments and the high prudential standards to which it is attempting to hold other private entities to account.

But what is the source of this carbon bias? The BoE determines the list of eligible bonds by applying a set of criteria to the entire universe of sterling non-financial corporate bonds. These criteria include, for example, the amount in issue, the credit rating of the bond and the extent to which the issuers of the bonds make a material contribution to the UK economy.¹⁰ In Table 2 we show how the proportion of the carbon-intensive sectors changes as we start from the universe of non-financial corporate bonds and we apply step-by-step the eligibility criteria. While the carbon bias already exists in the universe of bonds, it becomes worse as the eligibility criteria are applied. In particular, the criterion on the contribution to the UK economy (see last column) sharpens the carbon bias significantly.¹¹

Table 2: Contribution of the carbon-intensive sectors to the UK GVA and the outstanding amount of bonds in the sterling non-financial corporate bond market and the BoE list

	Share of UK GVA (%)	1: All sterling non-financial corporate bonds (%)	2: (1)+eligible maturity (%)	3: (2)+investment grade (%)	4: (3)+eligible amount in issue (%)	5: (4)+contribution to the UK economy (BoE list*) (%)
Fossil-fuel	0.8	3.8	4.1	5.1	5.0	8.6
Energy-intensive	5.6	3.5	3.6	4.1	4.2	6.3
Utilities	2.6	12.4	12.6	16.2	15.6	28.3
Carbon-intensive transportation	10.0	9.0	9.3	10.1	10.1	13.3
Non carbon-intensive sectors	81.0	71.4	70.3	64.5	65.1	43.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Bank of England (bond ISIN codes, as of 4 June 2020), TR Eikon (NACE 4-digit sectors, bond outstanding amount and other financial and economic variables, June 2020) and authors' calculations

* Note that the Bank of England (BoE) uses several other criteria to derive the full list, on top of the five described in the table. These additional criteria are described in Appendix A2.

As mentioned above, the Bank's interventions in corporate bond markets are in theory guided by the 'market neutrality' principle: purchase a representative portion such that the CBPS does not favour some issuing firms over others. However, the evidence presented here suggests that, despite this principle, the CBPS implicitly favours carbon-intensive sectors and firms. Indeed, simply attempting to reflect the composition of the bond market at a given point in time inevitably leads the BoE to reproduce the same market failures to price in climate change and carbon biases that now characterise the

market more generally. Ultimately, a concerted decision to align the CBPS with the market structure, rather than environmental goals and climate risks, is a choice to maintain the status quo – and a significant missed opportunity to propel investments that support a green economy.

3. ALTERNATIVE PURCHASE STRATEGIES

3.1 THE LOWER-CARBON PANDEMIC QE SCENARIO

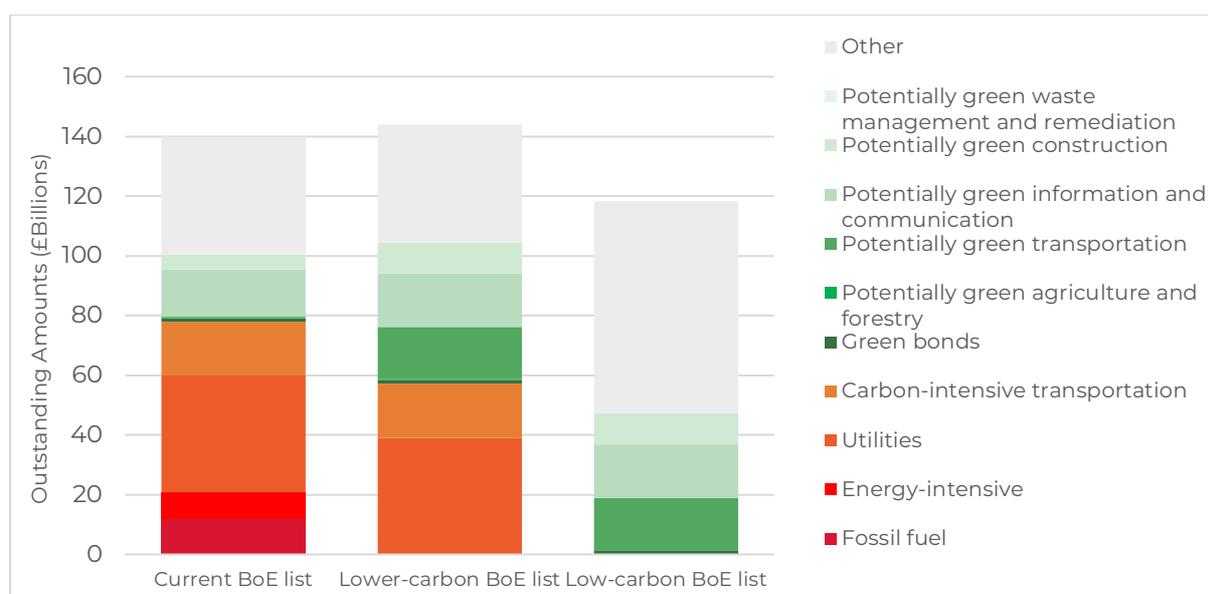
In order to decarbonise the BoE list of eligible bonds, we first remove bonds issued by fossil fuel and energy-intensive sectors. We replace them with:

- (i) green bonds, which are bonds that intend to fund climate mitigation and adaptation projects (see Appendix A2 for the exact definition);
- (ii) bonds issued by companies that belong to what we call 'potentially green' sectors and have at the same time a relatively low emission intensity¹² - we identify 'potentially green' sectors drawing on the recently developed EU Taxonomy of sustainable activities (see Appendix A2 for the details).

All the bonds that we have added meet the Bank's main criteria: they are all sterling non-financial, investment grade and are eligible according to their maturity and amount in issue.¹³

Figure 2 presents our Lower-carbon BoE list. The carbon-intensive sectors correspond to 40% of the outstanding amount instead of the original 57%. The proportion of green bonds and potentially green sectors has increased from 16% to 33%.¹⁴ The outstanding amount in the Lower-carbon list remains roughly the same as in the BoE list (£144bn vs £140bn).

Figure 2: BoE list vs Lower-carbon lists



Sources: Bank of England (bond ISIN codes, as of 4 June 2020), TR Eikon (NACE 4-digit sectors, bond outstanding amount and other financial and economic variables, June 2020) and authors' calculations

3.2 THE LOW-CARBON PANDEMIC QE SCENARIO

However, our Lower-carbon BoE list is only partially decarbonised. To arrive at a more substantial decarbonisation, we exclude bonds issued both by utilities and carbon-intensive transportation in addition to those issued by fossil fuel and energy-intensive sectors. Our Low-carbon list (see Figure 2) retains the green bonds issued by utilities and carbon-intensive transportation sectors.¹⁵

While we cannot identify additional green bonds and bonds issued by the potentially green sectors that would meet the BoE criteria regarding currency, investment grade, maturity and the amount in issue, we add bonds issued by 'other' companies that do not belong to the carbon-intensive sectors. These include corporates such as real estate companies, health insurance companies, hospitals, restaurants and universities. Our Low-carbon list includes bonds that have been issued by such companies that have both 1) a relatively low emission intensity, and 2) headquarters in the UK.¹⁶ The outstanding amount of bonds in the Low-carbon list is close to the amount in the current BoE list (£118bn vs £140bn).

CONCLUSION

The Bank of England pandemic QE is a missed opportunity for the Bank to contribute to the transition to a low-carbon economy and stop supporting environmentally harmful activities. Although the Bank recognises that a low-carbon QE programme is a 'perfectly sensible thing to do', this is currently not reflected in their bond eligibility criteria. To this end, we have presented two scenarios that would easily allow the Bank to match its rhetoric. The Bank should first replace the list of eligible bonds with one of our suggested Lower-carbon lists and then use this list as a basis for the new purchases that it will conduct in the next few months. Since in our low-carbon lists, the amount of bonds does not change significantly compared to the existing list, their use would not undermine the cyclical role that the QE programme is intended to play.

Apart from changing the structure of the existing QE programme, the Bank of England could also consider the possibility of running a separate permanent corporate QE programme with the explicit aim of supporting green bonds on a persistent, long-term basis, for example by committing itself to purchase a specific proportion of eligible green bonds.¹⁷ Such a programme could support the expansion of the green bond market, irrespective of the decisions that are taken about the cyclical QE programmes.

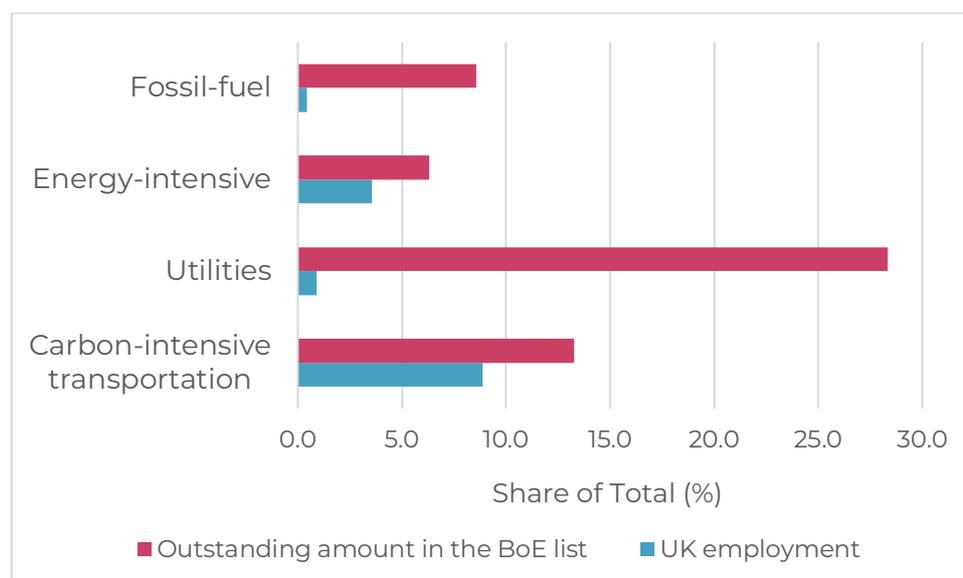
Would our proposals require a change in the mandate of the Bank of England? This is not necessarily the case. A broader interpretation of the financial stability mandate might suffice. Bonds issued by carbon-intensive sectors can be excluded from the corporate bond programme based on the rationale that they exhibit potentially high climate transition risks. The Bank could also view the support of green bonds as a way of contributing to the reduction of the long-run physical financial risks that stem from climate change.

Low-carbon and green corporate QE programmes would not in any case be sufficient to ensure the transition to a low-carbon economy. Fiscal policies have a stronger and more substantial role to play in achieving such a transition quickly.¹⁸ But the urgency of the climate crisis requires that all policy tools are used for the purpose of avoiding a climate breakdown. It is also crucial that the decarbonisation of the Bank of England QE programmes would provide a very clear signal to the financial markets that the era of 'dirty' finance would soon come to an end.

APPENDIX

A1. CARBON-INTENSIVE SECTORS AND UK EMPLOYMENT

Figure 3: Carbon-intensive sectors in the BoE list of eligible bonds and UK employment



Sources: Bank of England (bond ISIN codes, as of 4 June 2020), TR Eikon (NACE 4-digit sectors and bond outstanding amount, June 2020), ONS, Annual Business Survey (employment, 2018) and authors' calculations

A2. FROM THE UNIVERSE OF STERLING BONDS TO THE BOE LIST OF ELIGIBLE BONDS

We downloaded data for the universe of corporate bonds from Thomson Reuters (TR) Eikon and we applied the following BoE criteria step-by-step:

the bond has been issued in sterling by companies that do not belong to the following:
TR Eikon sectors: banks; independent finance; official and muni; life insurance, mortgage banking; securities; and supranational (see Column 1 in Table 2);

- the residual maturity of the bond is at least three months and the bond were issued at least one month before the BoE list of eligible bonds was published (see Column 2 in Table 2);
- the bond is rated investment grade (see Column 3 in Table 2);¹⁹
- the amount in issue is at least £100m (see Column 4 in Table 2).

The BoE also applies some additional criteria, the most important of which is that the bond issuers make a material contribution to the UK economy.²⁰ The BoE considers a

number of factors to identify this, including the number of employees that the company has in the UK, the revenues that the company generates in the UK and the extent to which the company has headquarters in the UK. Since the criterion about the material contribution to the UK economy is not strictly defined by the BoE and it seems that the selection process involves some discretion, we are not in a position to generate the BoE list captured by the last column of Table 2 based on specific criteria.²¹

The BoE list comprises of 382 bonds whose outstanding amount is £148bn. The list captured by column 5 includes initially all the bonds that are part of the BoE list. The match between the bonds and the companies that have issued them is made by using the International Securities Identification Number (ISIN). As explained in A3, our analysis requires the identification of the 4-digit NACE sector of the bond issuer. The bonds for which the NACE sector is not available in TR Eikon are thereby excluded from our analysis. Therefore, the ultimate number of bonds in the column 4 list is 1040 (with an outstanding amount of £428bn). We also keep 355 bonds from the BoE list which correspond to £140bn.

A3. IDENTIFYING THE ENVIRONMENTAL FOOTPRINT OF BONDS

We use four ways by which we identify the environmental footprint of each bond:

(1) *Whether the NACE 4-digit sector of the issuer corresponds to carbon-intensive activities.*

We identify carbon-intensive sectors following Battiston and Monasterolo (2019)²². The starting point is the Climate Policy Relevant Sectors (CPRS) classification, presented in Battiston et al. (2017)²³ and Alessi et al. (2019)²⁴. This classification specifies sectors that can be affected by climate policies and are subject to transition climate risks. However, not all of these sectors are necessarily carbon intensive. Battiston and Monasterolo (2019)²⁵ have identified four carbon-intensive sectors, which are a subset of CPRS: (i) fossil-fuel companies; (ii) energy-intensive companies; (iii) utilities and (iv) carbon-intensive transportation. We have identified NACE 4-digit codes that correspond to carbon-intensive sectors following the rationale of their classification. Note that someone could argue that utilities that generate electricity from renewable energy sources should not be included in the carbon-intensive sectors. Although this is true, we have limited information about the sources of power generation in utilities, which prevents us from clearly identifying which utilities rely solely on renewables.

(2) *Whether the NACE 4-digit sector of the issuer corresponds to potentially green activities.* We use the recently developed EU Taxonomy of sustainable activities²⁶ in

order to specify what we call 'potentially green' sectors. The EU Taxonomy identifies NACE 4-digit sectors that can contribute to climate mitigation via activities that (i) are already low-carbon, (ii) are not low-carbon but can contribute to the transition to a low-carbon economy by reducing emissions, and/or (iii) enable other activities to achieve emissions reductions. A limitation of this EU classification is that it includes many carbon-intensive sectors; this is primarily because there are various transition activities that can be undertaken in these sectors. Although we acknowledge the need for promoting activities that reduce emissions in carbon-intensive sectors, we find it misleading to call these activities 'green'. It would be more accurate to argue that these are 'dirty' activities, whose degree of dirtiness can decline. Thus, in our 'potentially green' sectors we include all these NACE sectors that are part of the EU Taxonomy for climate mitigation but are not carbon intensive. The only exception that we make is the real estate sector. Although this sector is included in the EU taxonomy and is not carbon-intensive, we think is not accurate enough to call it 'potentially green', since its contribution to emission reduction is likely to be very small.

The reason why our sectors are called 'potentially green' is that we do not have sufficient information to decide if the activities conducted by these sectors are actually green. The EU Taxonomy has specified screening criteria that include thresholds for metrics related, for example, to emission and energy generation. However, we do not have access to such detailed information at a sufficient granular level for all companies that are included in our analysis. As we explain below, we are able to only partially use the company-level emissions intensity (when this is available by TR Eikon).

(3) *Whether the bond is classified as green.* We use the green bond flag provided by TR Eikon. Eikon defines green bonds as fixed income products that offers investors the opportunity to participate in the financing of large sustainable, green energy projects that help mitigate climate change and help countries adapt to the effects of climate change.

(4) *The relative carbon intensity of the issuer.* We use the company-level emission intensity provided by TR Eikon. This is equal to the sum of Scope 1 and Scope 2 CO₂ equivalent emissions of the issuers over the company revenues. The data that we use refers to the 2018/19 financial year. The relative emission intensity is given by dividing the emission intensity of each by the mean emission intensity in the 1-digit NACE sector that the sector of the company belongs to.

Note that a large number of corporate bonds are issued by companies that engage in financial services and insurance activities (sectors K.64, K.65 and K.66). Following Battiston and Monasterolo (2019), for the bonds that have been issued by these

companies, we use the NACE codes and the emission intensity of the ultimate parent companies. In addition, if the NACE code of the parent companies is the same as the NACE of the K.64, K.65 and K.66 issuers, but TR Eikon provides information which clearly shows that the issuer supports directly a company that engages in carbon-intensive or potentially green activities, the bond is reclassified.

ENDNOTES

¹ Bank of England (2020). 'The Bank of England's Climate-Related financial disclosure 2020', June 2020. Available at: <https://www.bankofengland.co.uk/-/media/boe/files/annual-report/2020/climate-related-financial-disclosure-report-2019-20.pdf?la=en&hash=5DA959C54540287A2E90C823807E089055E6721B>.

² Reuters (2020). 'Highlights-Next Bank of England governor Bailey speaks in parliament', March 4, available at: <https://ru.reuters.com/article/idUKL8N2AX59B>

³ Van Lerven (2015, pp. 18-19) offers a broader conceptualisation of portfolio rebalancing: "By buying financial assets with newly-created money the central bank pushes up the price of those assets, which simultaneously pushes down the yield (i.e. returns) earned by holders of these assets. The lower returns should force investors to move their investments into riskier assets with higher yields (such as corporate bonds and shares), hopefully directing more credit and investment towards businesses in the real economy. Similarly, lower yields show lower borrowing costs for businesses that issue bonds, making it cheaper for them to invest or spend more." Van Lerven, F. (2015). 'Recovery in the Eurozone: Using money creation to stimulate the real economy', Positive Money policy paper. Available at: <http://positivemoney.org/wp-content/uploads/2015/12/Recovery-in-the-Eurozone-FINAL-WEB-READY-2015-12-11.pdf>

⁴ For a full list of the CBPS target sector shareholdings visit the Bank of England's website as: <https://www.bankofengland.co.uk/markets/bank-of-england-market-operations-guide/results-and-usage-data#apf-cbps>

⁵ The fact that the BoE corporate QE suffers from a carbon bias was firstly shown by Matikainen, S., Campiglio, E. and Zenghelis, D. (2017). 'The climate impact of quantitative easing', Policy Paper for Grantham Research Institute on Climate Change and the Environment, May 2017, available at: <http://www.lse.ac.uk/GranthamInstitute/publication/the-climate-impact-of-quantitative-easing/>. Table 1 illustrates that this continues to be the case.

⁶ In Table 1, high-emissions NACE 1-digit sectors are identified based on the contributions of these sectors to UK emissions. In the more granular approach, we identify NACE 4-digit carbon-intensive sectors based on detailed information about fossil-fuel related activities. For the latter approach, we draw on the Climate Policy Relevant Sectors (CPRS) classification developed by Battiston, S., Mandel, A., Monasterolo, I., Schütze, F. and Visentin, G. (2017). A climate stress-test of the financial system, Nature Climate Change, 7 (4), 283-290; see also Alessi, L., Battiston, S., Melo, A. and Roncoroni, A. (2019). 'The EU Sustainability Taxonomy: a Financial Impact Assessment', European Commission, available at: <https://ec.europa.eu/jrc/en/publication/eu-sustainability-taxonomy-financial-impact-assessment>. Carbon-intensive sectors are specified using the approach of Battiston, S. and Monasterolo, I. (2019). 'How could the ECB's monetary policy support the sustainable finance transition?', mimeo, University of Zurich, available at: <https://www.finexus.uzh.ch/dam/jcr:0103ed7b-71e9-4e81-9941-ee61feefd851/ECB%20sustainable%20finance%202022%20MarchIM.pdf>. For more details see Appendix A3.

⁷ This figure is pretty close to 63%, which is the proportion of bonds that correspond to carbon-intensive sectors in the European Central Bank Corporate Sector Purchase Programme (CSPP), according to Battiston, S. and Monasterolo, I. (2019). 'How could the ECB's monetary policy support the sustainable finance transition?', mimeo, University of Zurich, available at: <https://www.finexus.uzh.ch/dam/jcr:0103ed7b-71e9-4e81-9941-ee61feefd851/ECB%20sustainable%20finance%202022%20MarchIM.pdf>; see also Jourdan, S. and Kalinowski, W. (2019). 'Aligning Monetary Policy with the EU's Climate Targets', Veblen Institute for Economic reforms and Positive Money Europe, April 2019, available at: https://www.veblen-institute.org/IMG/pdf/aligning_monetary_policy_with_eu_s_climate_targets.pdf.

⁸ See Appendix A1.

⁹ For a review of the empirical evidence see Monnin, P. (2018). 'Central banks should reflect climate risks in monetary policy operations', SUERF Policy Note Issue No. 41, September 2018, available at: https://www.suerf.org/docx/f_936824c0191953647ec609b4f49bc964_3325_suerf.pdf

¹⁰ These criteria are described in Appendix A2.

¹¹ Since the material contribution to the UK economy is not specified in a strict way by the Bank, we cannot identify the exact reasons behind this increase in carbon bias. A potential explanation is that, despite the fact that the carbon-intensive sectors have overall a relatively low contribution to the UK employment and GVA, the size of the companies in these sectors is typically large. As a result, these

companies can be more easily selected for inclusion in the BoE list when company-level revenues and company-level employment are used as criteria.

¹² In particular, their relative emission intensity should not be higher than 1, when the data for this intensity is available from TR Eikon. For the way that the relative emission intensity is defined, see Appendix A3.

¹³ As alluded to above, the BoE does not provide clear-cut criteria for how it assesses the material contribution to the UK economy by corporate entities. Furthermore, we do not have access to detailed information about the issuers of these bonds in order to estimate the revenues that they generate in the UK or their number of UK based employees. We have therefore proxied the contribution to the UK economy using the information provided by TR Eikon on whether the company has headquarters in the UK or not. However, it is not necessarily the case that all the companies that have headquarters in the UK would be considered by the BoE to have a material contribution to the UK. Moreover, there might be companies that do not have headquarters in the UK, but the BoE may consider that they contribute materially to the UK economy based on other criteria.

¹⁴ Unilever, Royal Dutch Shell, BP, Rio Tinto and Total are some companies that are removed from the list. Examples of companies that are added are the Scottish Hydro Electric Transmission, the Network Rail Infrastructure Finance and the Saffron Housing Trust.

¹⁵ This means that if the Bank decides to adopt our approach, carbon-intensive sectors could still be included in the Bank of England purchases as long as they issue green bonds.

¹⁶ Excluded companies include Engie, Electricite de France, BMW, Toyota Motor and Porsche Automobil Holding. Companies that are added to the list are, for instance the Central Nottinghamshire Hospitals, the University of Cambridge, the Walsall Hospital Company and the Compass Group.

¹⁷ See Dafermos, Y., Nikolaidi, M. and Galanis, G. (2018). 'Can green Quantitative Easing (QE) reduce global warming?', Foundation for European Progressive Studies, Policy Brief July 2018, available at: <https://www.feps-europe.eu/attachments/publications/feps%20gperc%20policybriefgreenqe.pdf>

¹⁸ See Dafermos, Y. and Nikolaidi, M. (2019). Fiscal policy and ecological sustainability: a post-Keynesian perspective, PKES Working Paper No. 1912, available at: http://www.postkeynesian.net/downloads/working-papers/PKWP1912_09FfXGo.pdf

¹⁹ TR Eikon has a specific variable about the investment grade of the bonds. If a bond is not classified as investment grade according to this variable or the information is not available, we also check the ratings given by Standard & Poor's, Moody's and Fitch. If one of these rating agencies provides a rating of BBB- or higher (in the case of the Standard & Poor's and Fitch) or Baa3 or higher (in the case of Moody's), we include it in the list.

²⁰ The other criteria are that the bonds (i) are cleared and settled through Euroclear and/or Clearstream, (ii) need to be admitted to official listing on an EU stock exchange and (iii) need to be conventional senior unsecured or secured, unsubordinated debt. These criteria are not taken explicitly into account in our analysis. All the criteria that are used by the Bank of England are available here:

<https://www.bankofengland.co.uk/markets/market-notice/2020/asset-purchase-facility-additional-corporate-bond-purchases>; see also <https://www.bankofengland.co.uk/markets/market-notice/2020/apf-pricing-of-cbps-eligible-securities-june-2020>

²¹ The BoE list of bonds that are eligible for the CBPS as at 4 June 2020 is available here:

<https://www.bankofengland.co.uk/markets/bank-of-england-market-operations-guide/information-for-participants>

²² Battiston, S. and Monasterolo, I. (2019). 'How could the ECB's monetary policy support the sustainable finance transition?', mimeo, University of Zurich, available at:

<https://www.finexus.uzh.ch/dam/jcr:0103ed7b-71e9-4e81-9941-ee61feefd851/ECB%20sustainable%20finance%2022%20MarchIM.pdf>

²³ Battiston, S., Mandel, A., Monasterolo, I., Schütze, F. and Visentin, G. (2017). A climate stress-test of the financial system, *Nature Climate Change*, 7 (4), 283-290.

²⁴ Alessi, L., Battiston, S., Melo, A. and Roncoroni, A. (2019). 'The EU Sustainability Taxonomy: a Financial Impact Assessment', European Commission, available at: <https://ec.europa.eu/jrc/en/publication/eu-sustainability-taxonomy-financial-impact-assessment>

²⁵ Battiston, S. and Monasterolo, I. (2019). 'How could the ECB's monetary policy support the sustainable finance transition?', mimeo, University of Zurich, available at:

<https://www.finexus.uzh.ch/dam/jcr:0103ed7b-71e9-4e81-9941-ee61feefd851/ECB%20sustainable%20finance%2022%20MarchIM.pdf>

²⁶ See EU Technical Expert Group on Sustainable Finance (2020). 'Taxonomy: Final report of the Technical Expert Group on Sustainable Finance', Brussels, March 2020.