Policy Contribution
Issue n°20 | November 2020

Green certificates: a better version of green bonds

Dion Bongaerts and Dirk Schoenmaker

Executive summary

- **THE MARKET FOR GREEN BONDS IS GROWING** rapidly and has been boosted by the European Commission's plan to raise through green bonds 30 percent of the up to €750 billion that will be borrowed under the Next Generation EU coronavirus economic recovery programme. But while green bonds can reduce the financing costs of green projects and technologies, their current design means they fall short of fulfilling their full potential. Issuing green bonds alongside regular bonds fragments bond issues, reducing liquidity and thus increasing financing costs. Moreover, green bond prices reflect liquidity, credit risk and environmental performance jointly, which makes it difficult to isolate the part of the return on the bonds that relates to environmental performance.

- **WE PROPOSE AN ALTERNATIVE:** issuance of regular bonds with attached green certificates that ensure earmarking for green purposes. The new design would lead to more liquid securities (as only regular bonds are issued), which would reduce financing costs and in turn would provide incentives to start a greater number of environmentally-friendly projects. The new design would also make market prices more informative about environmental performance. In addition, green certificates would address the criticism that green bonds are used mostly for refinancing existing green projects rather than for new projects.

- **SOVEREIGNS ARE AMONG THE LARGEST ISSUERS OF BONDS** and are therefore natural candidates for implementation of green certificates. The European Commission could also issue regular bonds and green certificates to finance the European Union's recovery package, and should include green certificates in the under-preparation EU Green Bond standard. Commission issuance of green certificates would give a major boost to EU bonds as liquid safe assets while promoting green investment.

DION BONGAERTS is Associate Professor of Finance at Rotterdam School of Management, Erasmus University

DIRK SCHOENMAKER (dirk.schoenmaker@bruegel.org) is a Non-resident Fellow at Bruegel and Professor of Banking and Finance at Rotterdam School of Management, Erasmus University

Recommended citation
Bongaerts, D. and D. Schoenmaker (2020) 'Green certificates: a better version of green bonds', *Policy Contribution* 2020/20, Bruegel

1 Green bonds and their shortcomings

To meet the Paris Agreement goal of keeping the global temperature rise this century below 2 degrees Celsius above pre-industrial levels – and ideally below 1.5 degrees Celsius – $95 trillion in public and private investment will be needed globally for energy, transport, water and telecommunications infrastructure up to 2030, according to the Organisation for Economic Cooperation and Development (2018)[1]. Meanwhile, there are now calls to turn the recovery efforts after COVID-19 into a green recovery[2]. In addition, a growing number of investors wants to invest in the low-carbon transition, and are willing to accept slightly lower returns from that.

Green bonds can help meet these demands. They provide lower financing costs for environmentally-friendly projects and serve the growing clientele of green investors. European Commission President Ursula von der Leyen has set a target of raising through green bonds 30 percent of the up to €750 billion that will be borrowed under the Next Generation EU programme, the European Union's recovery fund to help tackle the economic impacts of COVID-19.

However, green bonds have design limits. When an issuer issues both regular bonds for its conventional projects and green bonds for its green projects, market liquidity, or ease of trading without affecting the price, is reduced for both types of bond – larger bond issues are more liquid. This lower liquidity of green bonds is a major drawback. Investors prefer liquid securities and so demand suffers, increasing yields paid to investors (Bongaerts *et al*, 2017). The increased yields in turn increase financing costs for both regular and green projects.

A different design would better cater to the growing market demand for green bonds while addressing the liquidity shortcomings. We propose that, rather than raising project finance through specific green bonds, issuers should issue regular bonds but attach to them green certificates. This approach would turn the negative impact on liquidity into a positive impact, as a greater number of environmentally-friendly projects can be financed while increasing regular bond issue size.

Green certificates are currently being considered in Denmark by the Danish Debt Management Office – to our knowledge, the first party to seriously look at this approach[3]. The European Commission might also consider our design and issue regular bonds and green certificates to finance the EU recovery package.

In this Policy Contribution, we start with a definition of green bonds and an overview of the growing market demand for them. We then discuss their drawbacks (section 3), and the benefits of the alternative green certificates approach and how a critical mass of green certificate issues can be attained (sections 4-6).

2 The green bond market is growing rapidly

Green bonds, or bonds that exclusively finance green projects, such as those that reduce greenhouse gas emissions or increase recycling, are a recent but fast-growing phenomenon. The first green bond was issued by the European Investment Bank in July 2007, and it took six years for the green bond market to pass $10 billion in cumulative issues. The market has

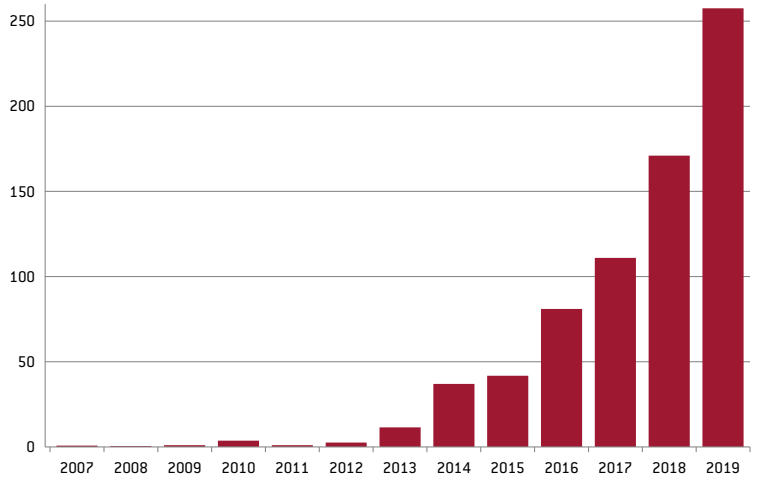
1 See also Schoenmaker and Schramade (2019).

2 See for example McWilliams *et al* (2020).

3 See http://www.nationalbanken.dk/en/governmentdebt/IR/Pages/Model-for-sovereign-green-bonds.aspx. The Danish proposal for issuing green certificates has been developed in parallel with our academic work on green certificates.

grown exponentially in recent years, passing global annual issuance of $250 billion in 2019 (Figure 1). At first, the market was dominated by international institutions such as the European Investment Bank, but from 2012 other types of issuers, including agencies, sovereigns, companies, municipalities and financial institutions, began to get involved. Related products were also launched, including green bond funds and green bond indices. Market-based standards followed suit, including the Climate Bond Standards (November 2010) and the Green Bond Principles (January 2014). The European Commission produced a draft EU Green Bond Standard as part of its 2018 Action Plan on Financing Sustainable Growth[4].

Figure 1: Global annual issuance of green bonds, $ billions



Source: Bruegel based on Climate Bonds Initiative.

Green bonds in principle provide environmental or climate change benefits, but are otherwise the same as other bonds. The vast majority (90 percent) of the green bonds issued are investment grade bonds (Zerbib, 2019). Institutional investors that pursue sustainable investing policies can buy these investment grade bonds. ICMA (2018) set out four criteria for determining whether a bond is green:

1. **Use of proceeds:** proceeds are exclusively for green projects, which should be appropriately described in the legal documentation accompanying the security;
2. **Process of project evaluation and selection:** the issuer should clearly communicate to investors what the environmental objectives are, the process by which the issuer determines how the project fits within eligible green project categories, and the related eligibility criteria;
3. **Management of proceeds:** the net proceeds of the green bond should be credited to a sub-account, and subsequently tracked and verified;
4. **Reporting:** mandatory reporting on the use of the proceeds.

But what is green? The draft EU Green Bond Standard (under development at time of writing) specifies that green projects should contribute substantially to at least one of the six environmental objectives[5]:

1. Climate change mitigation;
2. Climate change adaptation;

4 See https://ec.europa.eu/info/consultations/finance-2020-eu-green-bond-standard_en.

5 These are set out in Regulation EU/2020/852 on the establishment of a framework to facilitate sustainable investment (the EU green taxonomy).

3. Sustainable use and protection of water and marine resources;
4. Transition to a circular economy;
5. Pollution prevention and control;
6. Protection and restoration of biodiversity and ecosystems.

In addition, a green project aimed at contributing to one of these objectives should not undermine or harm any of the others. The EU thus provides a clear standard for 'green projects'. The draft EU Green Bond Standard would also require verification by an external party of the allocation of the proceeds to green projects.

Although green bonds are meant exclusively for financing green projects, they are not ring-fenced. That is, the bond's payments are not necessarily tied to the green project (unless the project constitutes all of the issuer's assets). So, the bond carries the same credit risk as other bonds from the same issuer with the same conditions. The main difference is the commitment to use the proceeds for green projects.

Sustainable investors are prepared to pay a green bond premium (resulting in a lower yield) for holding these bonds, a factor known as the 'clientele effect'. The green bond premium is defined as the difference in the yield from green bonds compared to perfectly matched reference bonds. The green bond premium ranges from 0 to 20 basis points and clusters around 5 basis points (Baker *et al*, 2018; Zerbib, 2019; Gianfrate and Peri, 2019; Flammer, 2020). These benefits in the form of lower financing costs are at least partially offset by higher issuing and reporting costs (ICMA criteria 2 to 4), which Gianfrate and Peri (2019) estimate at 5 basis points per annum[6].

The draft EU Green Bond Standard foresees mandatory verification of reporting. A major issue is the accreditation of external verifiers. The EU Technical Expert Group on Sustainable Finance[7] has recommended moving from the current market-based regime to a centralised accreditation regime overseen by the European Securities and Markets Authority (Technical Expert Group, 2019). Such a centralised regime would establish a unified approach and be in line with ESMA's comparable role in relation to credit rating agencies.

3 Fragmentation and unclear price signals

The issuance of green bonds leads to a fragmentation of bond issues, with regular and green bonds trading separately. As a result, green bonds are relatively illiquid, undermining demand and increasing yields (Bongaerts *et al*, 2017). The liquidity of other bonds from the same issuer might also suffer from fragmentation, leading to an additional liquidity spillover effect and increasing the yield on those other bonds. The increased yields in turn increase financing costs for both regular and green projects.

The proposed issuance of green bonds by the European Commission provides a good example. The financing of the EU recovery package of up to €750 billion would be split into €525 billion of regular bonds and up to €225 billion of green bonds, undermining liquidity for both bond issues[8].

Meanwhile, green bonds face a governance issue because calculating and evaluating the environmental performance of these projects is difficult. However, *ex-ante* assessments and

6 Note that additional issuing and reporting costs apply to all (partially) earmarked debt issues. Arguably, these are somewhat lower for green certificates due to simultaneous issuing alongside regular bonds and low issuance amounts.

7 See https://ec.europa.eu/info/publications/sustainable-finance-technical-expert-group_en.

8 As discussed by Lehmann (2020). He proposed to offer only regular bonds to set a standard for safe assets and create a liquid and transparent market in EU bonds.

ex-post verification of environmental performance are crucial governance mechanisms to prevent greenwashing and window dressing (ie projects that have no material effect on environmental footprint, or only marginal impact in terms of less pollution)[9].

If markets aggregate information well and provide incentives to produce information, one would expect little benefit from greenwashing using green bonds, since markets would find out about it and undo any reduction in funding costs. At the moment, environmental, social and governance (ESG) ratings primarily fulfil this role. Yet, current green/ESG ratings show relatively low correlation across ratings produced by different agencies. Berg *et al* (2019) showed an average correlation of 0.6, which is much lower than correlations among credit ratings produced by different rating agencies.

Measures based on the market prices of green debt instruments could provide an alternative to environmental ratings. A useful measure would be the yield difference between a green bond and a perfectly matched regular bond (we call this a reference bond). This yield difference is also termed the green spread. Intuitively this measure would indicate the yield reduction due to green earmarking. The most environmentally beneficial projects carry the lowest yields. Matching green bonds to reference bonds however is far from straightforward, for example because of the lack of reference bonds. As a result, green spreads come with significant estimation errors and therefore are poor indicators of issuers' environmental performance (Bongaerts and Schoenmaker, 2020).

4 Green certificates

The exponential growth of the green bond market shows that there is market demand for debt instruments with revenues earmarked for environmentally-friendly purposes. We propose a different security design to better cater to this market demand while addressing the fragmentation in liquidity and the unclear price signal. Rather than issuing green bonds, we propose the issuing of regular bonds plus green certificates. These certificates would certify to their holders that the proceeds of the bond will be invested in an environmentally-friendly way[10].

Green certificates would be capital market instruments like regular and green bonds. The cash flow rights (in the form of repayment of the principal and interest payments) remain with the bond, while the certificate provides the investor only with the utility of green investment (a so-called convenience yield). In addition, the certificate holder would have the sole right to report the associated notional value as a green investment.

As these green certificates do not entail any downside, they should be issued at a positive price, reflecting the market demand for the expected environmental payoff or reporting benefit. The bonds associated with green certificates need not be issued separately but can be pooled with other bond issues that also finance other, not necessarily environmentally-friendly, projects. This prevents fragmentation and thereby preserves liquidity.

The market demand for green certificates can arise from genuine concern about the environment or positive self-image on the part of buyers, or can be generated through regulation. In relation to the latter, the way in which green certificates are incorporated into environmental/integrated reporting would be important. We propose giving the holder of a certificate the sole right to report the face value of the associated bond as invested in an environmentally friendly way, even if no associated bond is held. To achieve this, green reporting standards need to be modified. Such a structure would allow for 'naked positions' in green certificates in

9 An example of such a green bond for window dressing purposes is https://www.reuters.com/article/us-china-greenbonds-coal/china-provides-1-billion-in-green-finance-to-coal-projects-in-first-half-of-the-year-idUSKCN1V90FY.

10 See Bongaerts and Schoenmaker (2020) for the underlying model of green certificates.

which investors green other investors' investments.

The value of a green certificate relates to the convenience yield and fluctuates with the 'greenness' of the project that is backed by the certificate. In a liquid and informationally efficient market, greater or lesser greening of a project during the maturity of the certificate[11] would lead to capital gains or losses respectively for the certificate holder.

This structure would be an example of financial engineering in which cash flow rights of bonds are split from earmarking features. The splitting of features in fixed income markets is not uncommon and is called 'stripping'. For example, a credit default swap (CDS) plus a treasury equals a credit risky corporate bond (Oehmke and Zawadowski, 2017), and a floating rate bond plus an interest rate swap equals a fixed-rate bond. The difference compared to most other forms of stripping is that what we propose would be done with a positive net supply of green certificates, while most other forms of stripping are done with derivatives (of which there is typically a net-zero supply). As a result, this way of stripping is much more likely to produce real effects at the issuer level and less likely to involve other problems related to derivatives, such as counterparty default risk.

5 Financing new projects

We can now add the clientele and fragmentation effects together to compare the effective cost of debt associated with different financing modes: regular bonds, green bonds, regular bonds with green certificates. Table 1 summarises the results.

Table 1: Price effects for different financing modes

Project financing	Clientele effect	Liquidity improvement project bonds	Liquidity improvement other bonds	Price transparency
Separate green bond	X			
Part of large issue with green certificates	X	X	X	X
Part of large issue		X	X	

Source: Bongaerts and Schoenmaker (2020).

If a project is financed through regular bond issuance, the effective financing costs would equal the frictionless cost of debt, plus a small liquidity premium (direct liquidity effect), minus a discount resulting from the indirect liquidity effect of issuing more bonds (the liquidity premium on the other bonds also goes down). If the project is financed by regular bonds paired with green certificates, the effective cost of debt would be reduced further because of the clientele effect.

By contrast, if the project is financed through green bonds, the effective cost of debt equals the frictionless cost of debt, plus a large liquidity premium (as there is no liquidity improvement for either the project bonds or the other bonds), minus the clientele effect. Hence, green certificate debt financing is cheaper than green bond financing. Both the direct and the indirect liquidity effects contribute to this advantage.

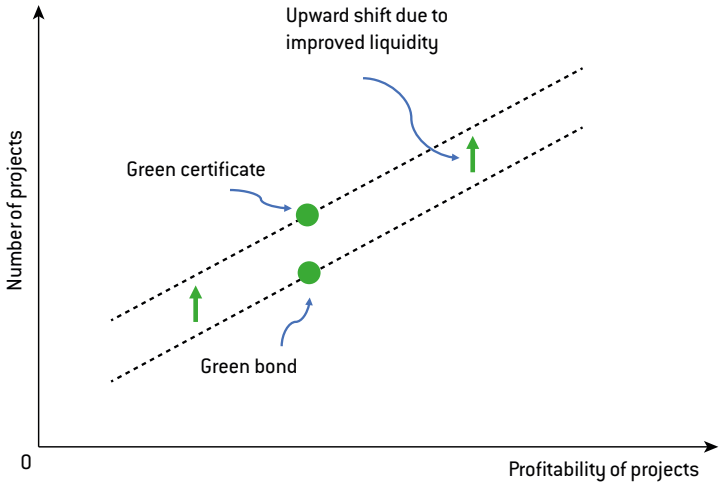
What would be the impact on the number of new green projects undertaken? The clientele

11 The maturity of the certificate matches the maturity of the underlying bond.

effect reduces the financing costs of both green bonds and green certificates[12]. However, the issuance of regular bonds with green certificates improves the liquidity of all bonds (the project bonds as well as other bonds) and thus reduces financing costs further relative to green bonds. At equal operating profitability, more green projects would become possible because of the lower financing costs of green certificates (Figure 2).

Green certificates would at least partially address the criticism that green bonds are used mostly for refinancing existing green projects rather than for new projects (Ehlers *et al*, 2020). The liquidity effect is maximised when there is a net increase in issuance, which is more likely to happen when new projects are started. Moreover, by lowering the financing costs of green projects explicitly, more green projects will be undertaken.

Figure 2: Number of green projects undertaken



Source: Bruegel.

Another advantage of green certificates is that changes to green certificate premiums provide a good signal of changes in environmental performance. Whereas the green certificate premium directly reflects the environmental performance, the green spread on a green bond is subject to substantial estimation errors (see the annex for a technical explanation). This better price signal from green certificate premiums increases the incentive to trade on environmental performance (Bongaerts and Schoenmaker, 2020).

6 Attaining critical mass

Green certificates will be most successful if there is a flourishing and liquid market. For a market to function well, one typically needs sufficient demand and supply (critical mass), as well as sufficient intermediation activity by dealers or market makers. We describe below which parties would be most influential in getting a market for green certificates started.

Supply side

In order to gain critical mass quickly, large issuers that commit to this design of security are needed. Sovereigns are among the largest issuers and therefore natural candidates. Moreover,

12 We assume that the reduction in financing costs due to the clientele effect is larger than the increase in issuance costs from green bonds or green certificates.

sovereign issues are liquid and safe (Feldhütter and Lando, 2008). In view of the scarcity of safe assets (Caballero *et al*, 2017), it is hard to ignore sovereigns as issuers. Finally, sovereigns have a certain amount of discretion in their allocation decisions in case of over-subscription (which is common). As such, they can reward primary dealers that are more willing to purchase, underwrite, and/or make a market in green certificates. In view of these arguments, it is therefore no surprise that the first party (to our knowledge) to seriously consider green certificates is the Danish Debt Management Office run by the Danish Central Bank (see section 1). The European Commission should also consider our design with regular bonds and green certificates to finance the EU recovery package.

Demand side

Similar to the supply side, the involvement of large investors is likely to help this market attain critical mass quickly. Naturally, investors with a fundamental demand for green investment instruments, in particular with debt features, would be good candidates to drive this transition. Pension funds and large insurance companies would be natural candidates because of their natural desire to hedge interest rate risk originating from the liability side. Sovereign wealth funds would also be candidates with a sufficiently large impact to accelerate this market. In particular, those funded by cash flow with a high environmental footprint, such as Norway's Oil Fund, may find this appealing because environmentally-friendly investments may partially hedge the risks to their cash flow originating from climate policies.

Converting outstanding green bonds

Issuers could consider offers to convert existing green bonds into regular bonds plus green certificates. This could be done in order to help the green certificate market grow further, to pool with a new issue and thereby let the new issue benefit from liquidity improvements or simply as a service to investors so they do not feel left out and to mitigate costs related to legacy products. In view of the superior properties of green certificate financing compared to green bond financing, investors should have few objections. If a minority of investors for whatever reason objects, such a conversion would impair the liquidity of outstanding green bonds even further, providing additional incentives for them to convert.

7 Conclusions

Supply of, and demand for, green bonds have risen exponentially in recent years. But the design of green bonds is an obstacle preventing full realisation of the benefits of green debt securities. The separate issuance of regular and green bonds reduces the liquidity of both types of bonds. Moreover, green bond prices poorly reflect environmental fundamentals.

We propose to progressively abolish green bonds and instead issue regular bonds with green certificates that ensure earmarking for green purposes. The new design would lead to more liquid securities (as only regular bonds are issued), reducing financing costs, which in turn would provide incentives to start a greater number of environmentally-friendly projects. The new design would also make market prices more informative about environmental performance. Calibration exercises show that the effects on price transparency and price discovery are economically very large.

The European Commission is finalising an EU Green Bond Standard, which will provide much needed clarity on what counts as green bonds and what does not. We recommend that the Commission includes green certificates in this standard. The conditions for projects to qualify as green and the verification requirements would remain the same for green bonds and green certificates. Holders of green certificates can then report the impact of financing green projects, just like holders of green bonds.

We further recommend that the Commission should also consider the issuance of regular bonds with green certificates. That would give a major boost to the EU bonds as liquid safe assets while promoting green investment. We hope to see green debt securities play a positive role in reducing the environmental footprint of humanity.

References

Baker, M., D. Bergstresser, G. Serafeim and J. Wurgler (2018) 'Financing the response to climate change: The pricing and ownership of US green bonds', *NBER Working Paper* w25194, National Bureau of Economic Research

Berg, F., J. Kölbel and R. Rigobon (2019) 'Aggregate Confusion: The Divergence of ESG Ratings', *MIT Sloan Research Paper* 5822-19

Bongaerts, D., F. de Jong and J. Driessen (2017) 'An asset pricing approach to liquidity effects in corporate bond markets', *Review of Financial Studies*, 30(4): 1229-1269

Bongaerts, D. and D. Schoenmaker (2020) 'The next step in green bond financing', mimeo, available at https://ssrn.com/abstract=3389762

Caballero, R. J., E. Farhi and P.-O. Gourinchas (2017) 'The safe assets shortage conundrum', *Journal of Economic Perspectives*, 31(3): 29-46

Ehlers, T., B. Mojon and F. Packer (2020) 'Green bonds and carbon emissions: exploring the case for a rating system at the firm level', *BIS Quarterly Review*, September: 31-47

Feldhütter, P. and D. Lando (2008) 'Decomposing swap spreads', *Journal of Financial Economics*, 88(2): 375-405

Flammer, C. (2020) 'Corporate green bonds', *Journal of Financial Economics*, forthcoming

Gianfrate, G. and M. Peri (2019) 'The green advantage: Exploring the convenience of issuing green bonds', *Journal of Cleaner Production*, 219: 127-135

ICMA (2018) *Green Bond Principles*, International Capital Markets Association

Lehmann, A. (2020) 'Common eurobonds should become Europe's safe asset – but they don't need to be green', *Bruegel Blog*, 28 September

McWilliams, B., S. Tagliapietra and G. Zachmann (2020) 'Greening the recovery by greening the fiscal consolidation', *Policy Brief* 2020/02, Bruegel

Nymand-Andersen, P. (2018) 'Yield curve modelling and a conceptual framework for estimating yield curves: Evidence from the European Central Bank's yield curves', *Statistics Paper Series* No. 27, European Central Bank

OECD (2018) *Subnational Public-Private Partnerships: Meeting Infrastructure Challenges*, OECD Multi-level Governance Studies, Organisation for Economic Cooperation and Development

Oehmke, M. and A. Zawadowski (2017) 'The anatomy of the CDS market', *Review of Financial Studies*, 30(1): 80-119

Schoenmaker, D. and W. Schramade (2019) 'Financing environmental and energy transitions for regions and cities: Creating local solutions for global challenges', paper for OECD high-level expert workshop on Financing Energy and Environmental Transition for Regions and Cities, 18 October, Organisation for Economic Cooperation and Development

Technical Expert Group (2019) *Report on EU Green Bond Standard*, Brussels

Zerbib, O. (2019) 'The effect of pro-environmental preferences on bond prices: Evidence from green bonds', *Journal of Banking & Finance*, 98: 39-60

Annex: Price signals from green spreads

Green spreads reflect the difference between yields on green bonds and yields on regular bonds. What do changes in these green spreads tell us? Changes in green spreads reflect poorly changes in environmental performance of green bonds, as explained in section 3. Changes in green certificate premiums fare much better. We use a so-called 'information ratio' to explain this difference (Bongaerts and Schoenmaker, 2020). The information ratio is the ratio of the variance of environmental performance changes over the variance of empirically observed changes in green spreads or green certificate premiums. In a frictionless market, all price changes are driven by information on environmental performance of the issuing entity and the information ratio equals one.

Yet, frictions such as yield curve fitting errors or transaction costs, infuse noise into empirically observed price changes, thereby lowering the information ratio. Green certificates do not require the estimation of reference bond yields. Hence, green certificate premium changes are noise-free and purely reflect changes in fundamentals. By contrast, the information ratio of the green spread changes is lower. Reference bond yields are used to construct green spreads. To quantify the information shortfall, we need to calibrate the fitting error (the error in fitting the green bond to the reference bond) and the fluctuations in environmental performance to realistic values[13].

Using those realistic values, Table 2 shows that 18 percent of the annualised variance and 5 percent of the quarterly variance of changes in estimated green spreads is driven by changes in environmental performance and, respectively, 82 percent and 95 percent by yield curve fitting noise. Hence, changes in green spreads poorly reflect changes in environmental fundamentals, which is not the case for changes in green certificate premiums. Hence, changes in green certificate premiums provide a good signal of changes in environmental performance. This better price signal of green certificate premiums provides also a greater incentive to trade on environmental performance (Bongaerts and Schoenmaker, 2020).

Table 2: Information ratios of changes in green spreads vs green certificate premiums

	Green bond spread	Green certificate premium
Annual	18.2%	100%
Quarterly	5.3%	100%

Source: Bongaerts and Schoenmaker (2020). Notes: The table shows the ratio of the variance in environmental performance over the variance of observed price green spread and green certificate premium changes at an annual and quarterly horizon. Reference bond yields that are used to construct green spreads are obtained from yield curves that are estimated with noise.

13 More technically, we assume that yield curve estimates for reference bonds have fitting errors with a standard deviation of 6 basis points as in Nymand-Andersen (2018). We also assume that changes in the environmental performance of an issuer have an annualised volatility of 4 basis points (Bongaerts and Schoenmaker, 2020).