Incorporating sustainability factors into asset management

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Abstract

This article analyses the reasons why an investor might be interested in investing in a sustainable asset. First, we observe that the rate of return required in the market is lower than that of other assets lacking the green label. This is shown to be the case even for assets with the same level of risk. Accordingly, it does not seem as though it can be attributed to climate-change risks being priced in by the market. However, the investor base for sustainable assets is shown to differ from that for conventional assets. It can therefore be argued that investors in these assets use a type of optimisation in which they incorporate a third factor (sustainability), in addition to minimising risk and maximising return, into the selection of their investment portfolios. Lastly, this article explores the various strategies that investors might adopt to incorporate the sustainability factor into their asset portfolios.

1 Introduction

The commitments to reduce greenhouse gas emissions under the Paris Agreement will require sizeable investments. The agreement itself establishes the need to mobilise the funding required to achieve the transition to a more sustainable economy [Marqués and Romo (2018)]. Indeed, the European Commission estimates that to cover the sustainable investment needs that the European Union would be required to make under the European Green Deal Investment Plan, €1 trillion would need to be mobilised over the next decade. To this figure we must add the financing needs in other economic areas.

To steer funds towards initiatives related to mitigation and the transition to a sustainable economy, financial markets commenced the transition via a solution involving the issuance of green bonds.[1] This is an increasingly relevant market segment that is undergoing exponential growth (see Chart 1). In 2009, issuance was less than $1 billion, whereas in 2019 alone it totalled $200 billion. The currency distribution is similar to that of conventional bonds. This shows that this market has a broad geographical distribution and is not exclusive to a single region.

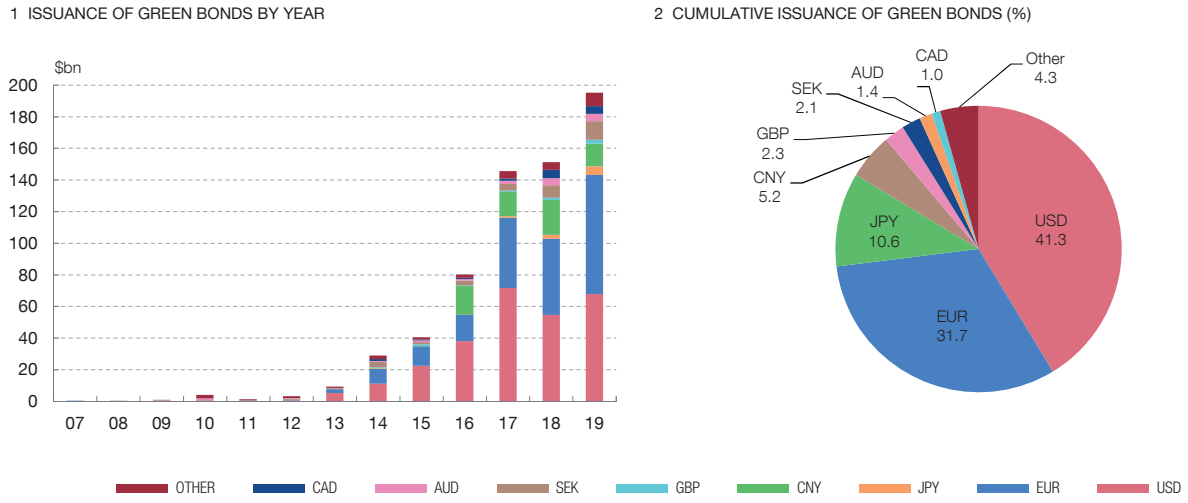
The increase in the supply of green assets has been accompanied by rising demand from investors, so much so that the yield required by the market on these assets can

1 A green bond is one whose funds are earmarked for financing projects that are directly related to sustainability, the preservation of natural resources and the transition to a low-carbon economy [González and Núñez (2019)]. The principles that a bond must satisfy to be considered green include: the identification of the activity to be financed; the quantification of the environmental impact; periodic reporting on the use of the funds; and certification by an external assessor of attainment of the goals set for the issuance.

Chart 1

GREEN BONDS ISSUED BETWEEN 2007 AND 2019 BY CURRENCY OF ISSUANCE (a)

Issuance of green bonds has grown exponentially.



SOURCE: Climate Bonds Initiative.

a To make the issues comparable, the volumes issued were translated using the average US dollar exchange rate for each year.

be lower than that sought on other similar assets lacking an explicit and pre-specified "green" use. This yield spread in favour of green bonds is referred to as a green premium or "greenium".

Some previous studies have estimated this greenium. For instance, Fatica et al. (2019) analyse 268,083 issues, 1,131 of which are green. The paper finds that no premium exists for bonds issued by financial institutions, while a negative premium (lower yield on green bonds than on conventional ones) does exist in the case of those issued by non-financial corporations and by supranational institutions especially. The findings of Larcker and Watts (2020), for a sample of 2,896 green bonds issued between June 2013 and July 2018, and Hachenberg and Schiereck (2018), for a limited sample of 63 bonds, are somewhat similar. Conversely, the findings of Karpf and Mandel (2017) point to a small positive premium (higher yield on green bonds than on conventional ones) in the US municipal bond market. Bachelet et al. (2019) propose an explanation for this discrepancy. Upon analysing 89 bonds from institutional and corporate issuers, the authors found that for (small) private issuers there is a positive yield spread for green versus conventional bonds. They attribute this to their lower liquidity. This reasoning is reinforced because, conversely, for institutional issuers, which have higher liquidity, the spread is negative (around 2 bp). Ehlers and Packer (2017), comparing bonds from the same issuer, calculate a greenium ranging from 10 bp on AAA bonds to 40 bp for BBB bonds. Baker et al. (2018) estimate that in the case of US municipal bonds, green bonds have

yields 26 bp lower than conventional ones. Lastly, Zerbib (2019) estimates a slightly negative premium of –2 bp on average for green bonds versus equivalent conventional ones for the entire sample (between 2013 and 2017). This was corroborated when analysing the euro and US dollar portfolios separately.

First, this article aims to identify whether the greenium referred to in the literature exists (Section 2). To do so, green and conventional bonds issued by the same institution – and, therefore, free of credit risk – and equities are analysed. Upon confirming its existence (and its upward path), we are faced with the mystery of why this potential inconsistency in the market exists. It could only be explained by either a different risk level or by the existence of a sustainability factor incorporated by the investors in addition to yield and risk (Section 3). Section 4 explores the possibility of whether sustainability is including risk factors. However, we confirm that there is scant connection between the two. This leads us to favour the sustainability factor option. Section 5 explores, from a theoretical standpoint, how this third dimension in the selection of investment portfolios may explain the existence of a negative greenium, and how the various sustainable investment strategies tally with the aforementioned theoretical approach.

2 The emergence of a greenium in the financial markets

Broadly speaking, financial assets are deemed to have different yields if their risk levels change. For instance, in the case of fixed-income securities, the differences may be due to varying credit risk, because of the issuer or because of the creditor's priority in the ranking of claims (senior debt versus subordinated debt), or additional collateral items (such as covered bonds). Among bonds with the same credit risk (same issuer, priority in the ranking of claims and collateral items), yield spreads may arise due to their different duration, which implies a different sensitivity to interest rate fluctuations. Controlling for all of these aspects is necessary if we want to estimate a greenium.

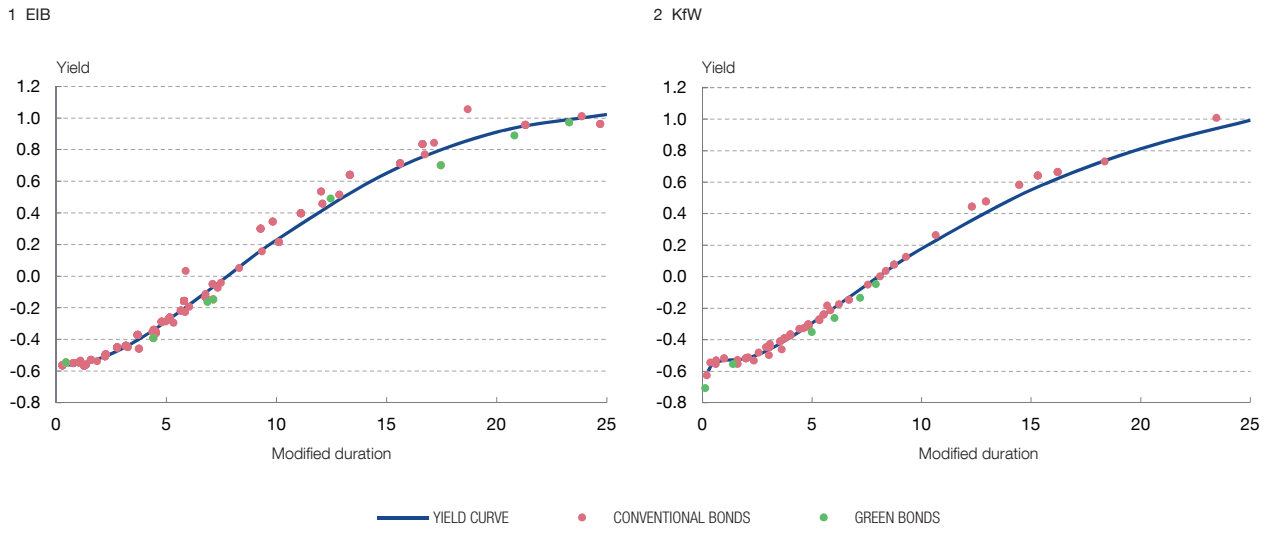
To estimate a greenium as accurately as possible, we have focused on two particular issuers, which have regularly issued green bonds for a longer period: the European Investment Bank (EIB) and Kreditanstalt für Wiederaufbau (KfW) (see Chart 2). This enables us to rule out differences due to different levels of credit risk, since all the bonds considered have the same credit risk level (they are all senior debt, from the same issuer and without additional collateral items). To control for duration risk, we only used fixed-rate bonds and estimated the yield curve for each specific day,[2] using these issuers' (KfW and EIB) conventional bonds lacking the "green label", and compared the theoretical yield that, based on this curve, each green bond would have with the yield actually observed in the market for those green bonds. By comparing bonds with the same level of credit and duration risk, the spreads can

2 Using the Svensson model for the term structure of interest rates.

Chart 2

YIELD CURVE OF BONDS ISSUED BY THE EIB AND KfW (a)

The market demands a lower yield on green bonds than on other bonds, even when they are issued by the same issuer and have the same risk level.



SOURCE: Own calculations.

a Market prices on 31 May 2019.

only be considered to be greeniums. For instance, Chart 2 shows how to obtain this greenium on a specific day (31 May 2019). In this case, Chart 2 shows the yield of the various fixed-rate bonds denominated in euro issued by KfW and EIB based on their duration (conventional bonds in brown and green bonds in green). Using the estimated curve as a reference, we can see that for green bonds in the 4 to 8 year tranche, the (negative) greenium is between 6 and 8 bp for EIB and KfW, respectively.

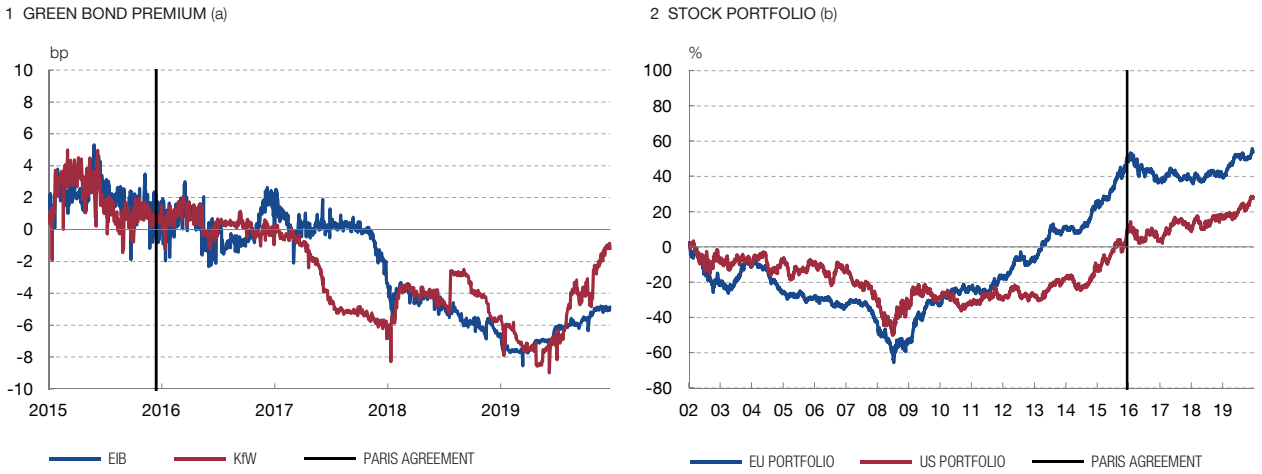
By replicating this analysis daily (from January 2015 to December 2019), it is possible to obtain the trend in the greenium, as shown in Chart 3.1, for both the EIB and KfW. At the start of the period analysed (2015-2016), we observe that there is no greenium or, where there is, it appears to be positive. This finding would be consistent with Bachelet et al. (2019) concerning the lower liquidity of green bonds, which could result in them having a positive premium. Yet following the adoption of the Paris Agreement, and as issuance of and appetite for green bonds have increased, penalties due to the lack of liquidity have ceased to be relevant. Conversely, throughout 2017 (for KfW) and 2018 (for the EIB) the premiums began to be negative (in favour of green bonds versus conventional bonds) reaching 8 bp in 2019 H1. However, they diminished in 2019 H2.

The findings are not confined to the bond market. Although the possibility of isolating the greenium from other factors is especially viable with bonds where we have

Chart 3

YIELD SPREADS BETWEEN GREEN AND CONVENTIONAL ASSETS IN THE FIXED INCOME (CHART 3.1) AND EQUITY (CHART 3.2) MARKETS

Investors require lower yields on greener assets in both the fixed income and equity markets.



SOURCE: Banco de España.

a The premium is calculated as the average of the spreads between the yield of the green bonds and the yield they should have based on the yield curve estimated using conventional bonds.
b The cumulative yield is calculated on the basis of a portfolio with a long position in the 10% of the assets with the smallest carbon footprint (excluding financial assets), financed via a short position in the 10% of the assets with the largest carbon footprint.

multiple assets from the same issuer, it is also possible to perform a somewhat less accurate analysis with shares. For instance, in the equity market we also observe different behaviour across greener or browner assets. To make this comparison, we used non-financial corporations on the Standard & Poor's 500 and broad EURO STOXX indices. We then organised these firms on the basis of their carbon footprint (standardised by their respective value-added) and, for each jurisdiction, we created a portfolio with a long position in the 10% of firms with the smallest carbon footprint (equal-weighted), financed with a short position in the 10% of firms with the largest carbon footprint (also equal-weighted). By having a long and short position, we are controlling for the market factors affecting all the firms equally. Therefore, the portfolio's yield should be guided by the factor differentiating the long and short positions, i.e. their carbon footprint. The outcome of this investment strategy is presented in Chart 3.2. This shows that until 2008 this strategy was clearly negative (i.e. the firms with the largest carbon footprint performed better on the stock market than those with the smallest carbon footprint).[3] However, this changes between 2009 and 2016, with a clear advantage for the firms with the smallest carbon footprint, particularly for the European portfolio. This difference in performance has held in

3 This finding is consistent with Delgado (2019). In this case, the NPL ratio of the industries with the largest carbon footprint was lower than that of the whole economy. This difference is attributed to the fact that they are more mature industries with fewer historical risks in which climate change is not a factor. However, were we to consider the future climate risks, the outlook changes. This would be where the balance of risks would shift.

Europe and increased in the United States in recent years. Hence, the markets can be deemed to also be demanding a lower return on the shares in greener corporations. This would once again be a greenium in the equity market.[4]

3 Theoretical justification for the existence of a greenium

The presence of a greenium may be viewed as paradoxical. If there were no difference in risk between a conventional asset and a green asset (as is the case with green and conventional bonds issued by the same issuer),[5] we would be in a situation such as that reflected in Chart 4.1. The assets that are on the efficient frontier are those that offer the highest return for a given risk level. Under this framework, the existence of a negative greenium means that, for the same risk level, green assets offer a lower expected return than other conventional alternatives. Thus, green bonds would be less attractive than conventional bonds and demand for them should be lower. For a rational investor seeking to optimise profitability versus risk, there is no incentive for investing in green assets.[6]

A possible explanation to this paradox is that the markets are considering that conventional bonds are riskier than green bonds (thus explaining the existence of a greenium). This would mean that Chart 4.1 is incorrect because, in reality, the efficient frontier would be shifted to the right for conventional bonds, as the risk would be higher than customary metrics would imply (see Chart 4.2). In this situation, the green bonds would be above the frontier, since investors would be incorporating climate risks into their investment decisions, despite these decisions not being included in the customary metrics. In this situation greenium estimates do not reflect a greater preference for green bonds, but rather the incorrect valuation of conventional bonds' climate risks.

This explanation may be valid for bonds issued by different issuers that are exposed to different climate risk levels. However, it is more difficult to justify when the difference is found between green and conventional bonds issued by the same issuer, since they have the same risk level (money is fungible and they have the same payment priority as the rest of the issuer's senior debt); therefore, the greenium cannot be attributed to a different risk level. The only alternative in this case is to consider that in seeking to optimise their portfolios, investors not only take into account return and risk factors, but they increasingly take into account a third factor we could call sustainability (see Chart 5).

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4 Unlike with the green bonds, in the exercise with the equity portfolios we did not control for the long and short positions' potentially different risk levels.

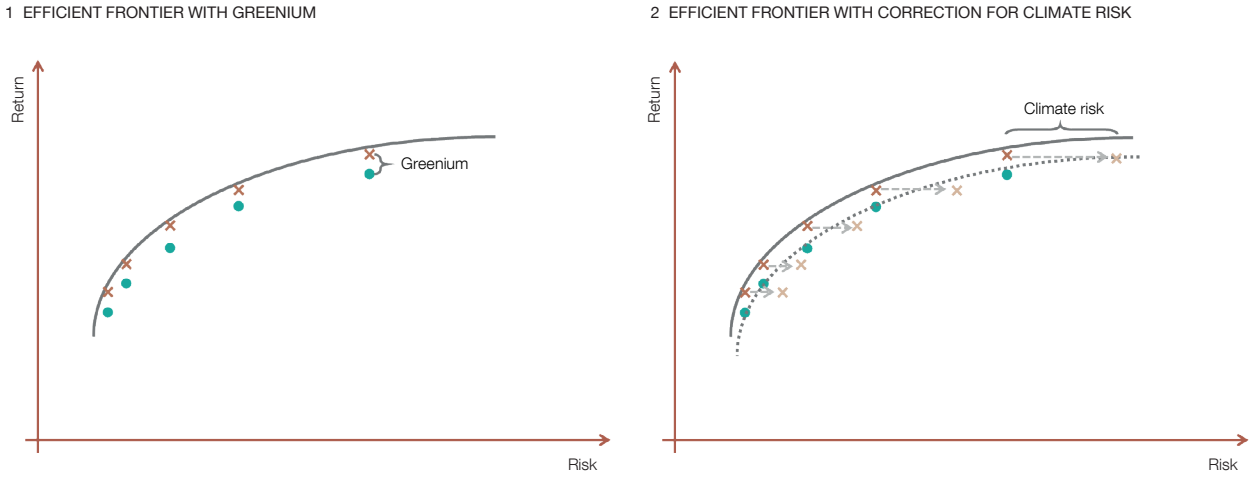
5 The greenium obtained can be understood to have a lower value, since we are comparing a single issuer's issues, with the same risk. If we were to look at different firms, the difference in profitability would be even higher [see Marqués and Romo (2018)].

6 By contrast, if there were no greenium, issuers would lack incentives for their issuance as such (particularly if it is borne in mind that green bond certification and subsequent verification entails additional costs for the issuer). However, what is observed is that this market is growing.

Chart 4

EFFICIENT FRONTIER FOR GREEN AND CONVENTIONAL BONDS

There are alternative explanations for the differences between green and conventional bond returns.

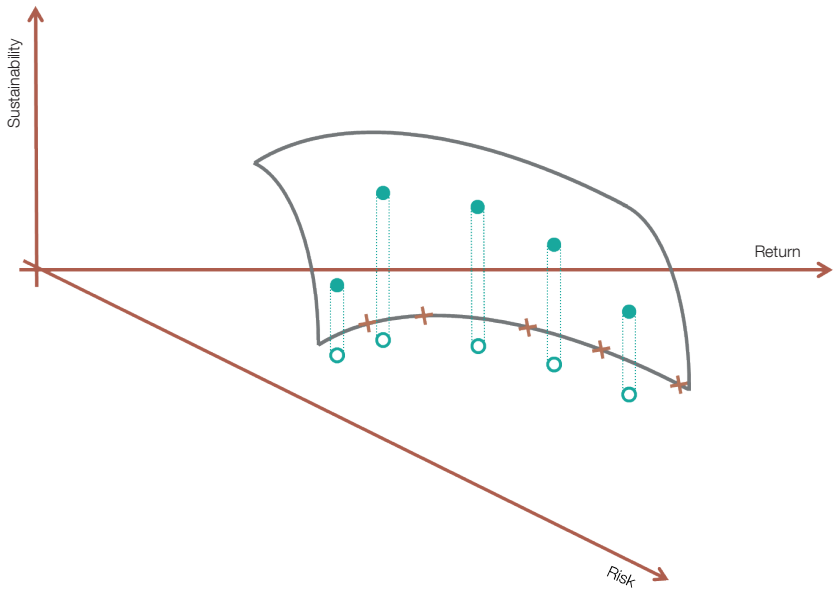


SOURCE: Own data.

Chart 5

EFFICIENT FRONTIER FOR GREEN AND CONVENTIONAL BONDS

There are alternative explanations for the differences between green and conventional bond returns.



SOURCE: Own data.

Under the theoretical framework of Chart 5, we move from portfolio optimisation according to risk-return criteria to optimisation based on three criteria (return-risk-sustainability). The efficient frontier would now have three dimensions (with sustainability being the third axis). Conventional bonds would be on the risk-return efficient frontier if the sustainability factor was zero (the same as in Chart 4.1). However, for higher sustainability values, the efficient frontier would shift to the right (the same as in Chart 4.2). The greenium would thus be the result of the projection of the return-risk-sustainability efficiency area on the risk-return plane.

In the next two sections we will explore the implications of the two alternatives proposed (different risk level, preference for sustainability).

4 Climate risk

Climate change can be considered as a source of financial risk [NGFS (2019a)], insofar as the materialisation of some of the most adverse scenarios would result in losses in the value of physical and financial assets. However, climate risks differ from other traditional financial risks in certain essential aspects. First, they can be considered to have a greater scope and magnitude than the usual risks (market, credit and operational). This is because the effects of climate risks are widespread across multiple agents and firms and in most cases they are irreversible once a specific threshold is reached. Second, as this is an unprecedented situation, past data provide scant information about performance under the different scenarios. In addition, these scenarios are contingent upon public decisions and policies adopted and implemented now or in the immediate future. Therefore, although it is a predictable risk, it subject to a high level of uncertainty.

The literature on risks associated with climate change has traditionally classified these risks into two large categories: physical and transition risks.

Physical risks arise from climate-related events and from changes in the equilibrium of ecosystems. These risks include the probability of incurring financial losses resulting from the growing severity and frequency of extreme meteorological phenomena (such as heat waves, landslides, flooding, forest fires and storms) and progressive long-term climate change (such as changes in precipitation, extreme climate variability, ocean acidification, and rising sea levels and average temperatures). Not all sectors are equally exposed to these risks, just like the geographical location of economic activity affects exposure to physical risks. However, the variable that does not need to be related to physical risk is the amount of greenhouse gas emissions produced by issuers of financial assets. In this connection, the physical risks of climate change are a paradigmatic example of the negative externality of CO_2 emissions.

Transition risks are related to the transition towards an economy low in greenhouse gas emissions. Meeting the carbon footprint reduction commitments of the Paris Agreement will likely require implementing more stringent legislation or the creation of carbon taxes, changing agents' preferences and the production or demand for certain products. Likewise, agents' preferences and research may lead to technological changes that render products or sectors obsolete. In any event, this transition might significantly affect certain sectors of the economy, causing losses in the value of the financial assets linked to them.

Transition risk depends on the type of regulatory response given to climate change and, with it, the type of transition such response entails. For instance, an early, but gradual, response might be sufficient to correct the main negative effects of climate change, in turn minimising transition risks. Conversely, if the response is delayed, physical risks might materialise and the response would have to be sudden and unforeseen, possibly prompting a disorderly transition process in attempting to avoid further physical risks. This implies that the two types of risks will be very closely related. Unlike physical risks, it may be thought that transition risks will mostly affect the sectors emitting the most greenhouse gases, since they are those that will have to bear more taxes and more legislative pressure. However, it cannot be ruled out that undesirable effects resulting from the transition will ultimately affect persons or sectors not responsible for the current situation of exposure to climate change risk.

In the case of both physical and transition risk, the main problem is the difficulty in assessing climate risks owing to the complexity of their estimation, as reflected by the absence of consistent data among providers [Alonso and Marqués (2019)]. To illustrate this problem, we will compare credit ratings with Environmental, Social and Governance (ESG) ratings at end-2019. Thus, in the case of credit ratings by the main credit rating agencies, considerable alignment is observed between the different agencies' opinions (see Chart 6). However, if we try to conduct the same exercise using ESG ratings, a much higher dispersion between data providers' opinions is seen (see Chart 7). This divergence makes the use of ESG ratings in asset valuation more difficult.

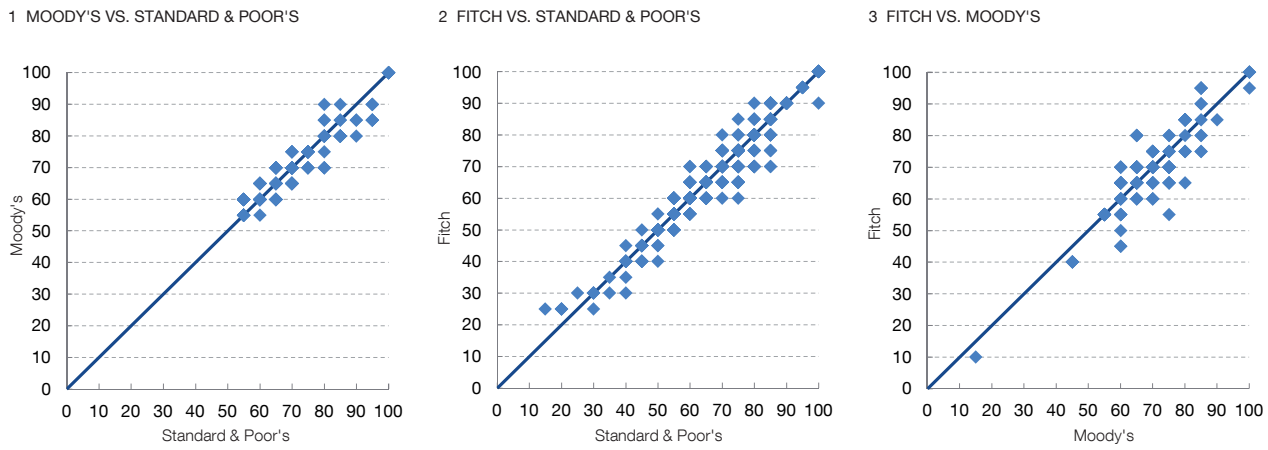
Insofar as climate change is a source of financial risk, rating agencies may be expected to have included these considerations in their own credit ratings. However, a comparison of credit ratings with ESG ratings shows that the correlation between the two is quite low (see Chart 8). Indeed, issuers with a higher credit rating are not necessarily those with better valuations in terms of exposures to climate risk.

A hypothesis about this low correlation, reflecting the scant impact of climate factors on credit risk, is the difference between the evaluation horizons of the risks assessed. While rating agencies assess the risk that an issuer will not meet its financial

Chart 6

CREDIT RATING ALIGNMENT BETWEEN AGENCIES (a)

Issue risk assessments by credit rating agencies are aligned.



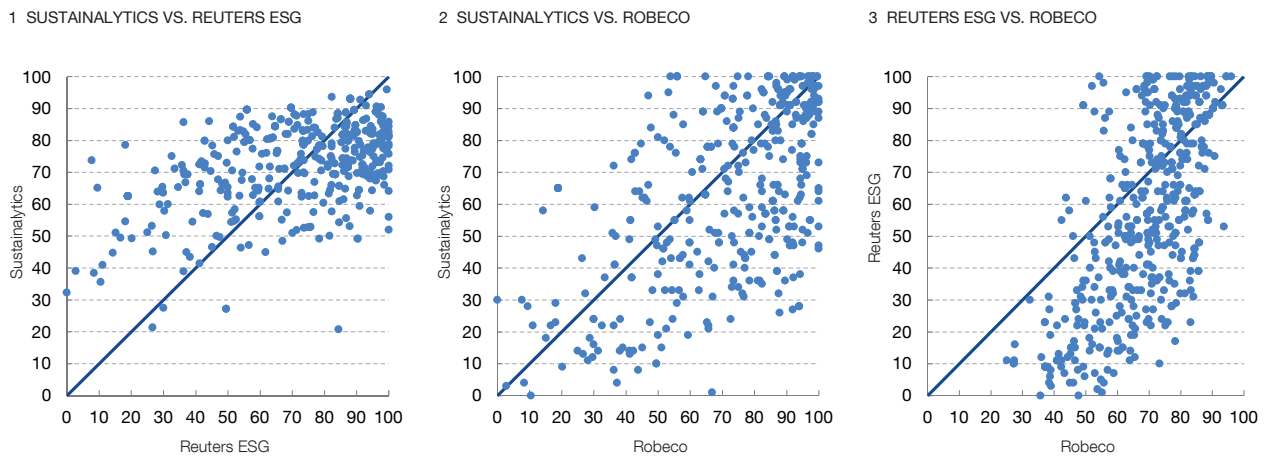
SOURCES: Moody's, Standard & Poor's and Fitch.

a The scales between agencies have been standardised based on their equivalences, subsequently standardising the scores on the basis of deciles.

Chart 7

ALIGNMENT BETWEEN ESG DATA PROVIDERS (a)

Sustainability assessments by different sources are highly dispersed.



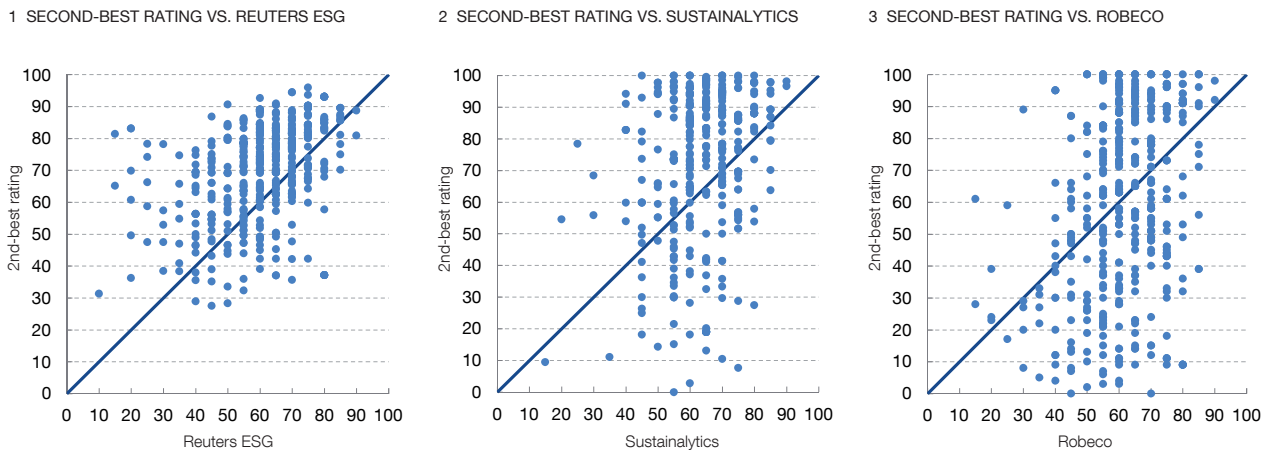
SOURCES: Reuters, Robeco and Sustainalytics.

a The ESG scales have been standardised on the basis of deciles, the lowest levels being those with a lower green score.

Chart 8

CORRELATION BETWEEN CREDIT RATINGS AND GREEN RATINGS

The correlation between assessments by credit rating agencies and sustainability ratings providers is very low.



SOURCES: Moody's, Fitch, Standard & Poor's, Reuters, Robeco and Sustainalytics.

obligations over a 2-3 year horizon, climate risks have a probability of materialising and affecting the valuation of the assets over a significantly longer horizon. This is reflected in the correlation between the two types of risk being even lower when we compare short-term credit ratings (which assess compliance risk over a few months) with climate-related ratings (see Chart 9.1). These results appear to suggest that as the credit risk assessment horizon becomes longer, the weight of climate-related considerations increases. Inevitably, ratings at longer terms than those currently calculated would take them into account.

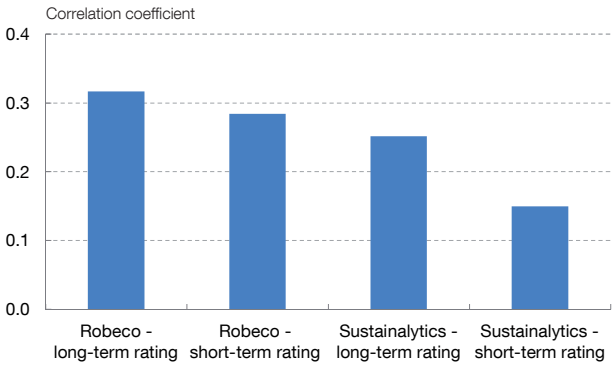
Indeed, the relationship between credit risk and ESG ratings may even be negative. Although sovereign bonds do not usually have ESG ratings, we can associate them with the country's carbon footprint. As seen in Chart 9.2, at least in the case of EU countries, the carbon footprint and the credit rating are inversely related.

Nevertheless, all of this reasoning is based on considering that green assets and conventional assets have a different risk profile. However, as shown in Section 1, even assets that have the same issuer may have a different price depending on whether or not they are classified as green. Given this situation, it is difficult to justify that the premium is due to a different risk profile. One explanation could lie in the commitments involved in the issuance of a green bond. The commitment to invest in green activities means that, in addition to a default risk (credit risk), the bond would have a green default risk. Although this second risk does not entail declaring a credit event for the issuer, it would give rise to a reputational loss for the issuer. It could be argued that in order to avoid the effects of such reputational risk, before failing to

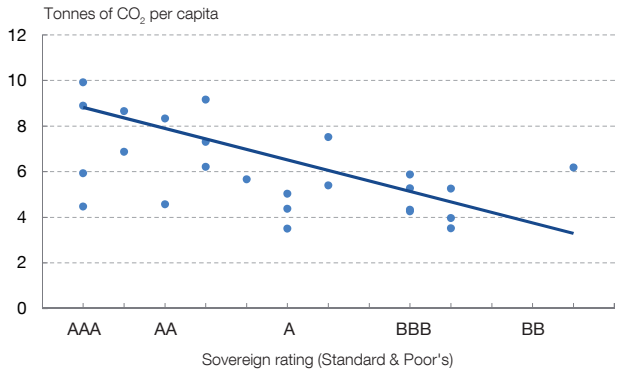
Chart 9

CORRELATION BETWEEN CLIMATE RATINGS AND CREDIT RATINGS, BY ASSESSMENT HORIZON AND BY COUNTRY, BASED ON CO_2 EMISSIONS

1 CORRELATION BETWEEN CLIMATE RATINGS AND CREDIT RATINGS



2 RELATIONSHIP BETWEEN CO_2 EMISSIONS AND SOVEREIGN RATING



SOURCES: Robeco, Sustainalytics, Standard & Poor's and Eurostat.

meet the commitment, the issuer would redeem the bond early, which would justify a negative premium. However, there is no way of substantiating this reasoning to date, nor of assessing whether reputational risk would be sufficient to justify the differences in return observed, since debt issuers have still not seen sufficient green defaults.

5 Investor base strategies

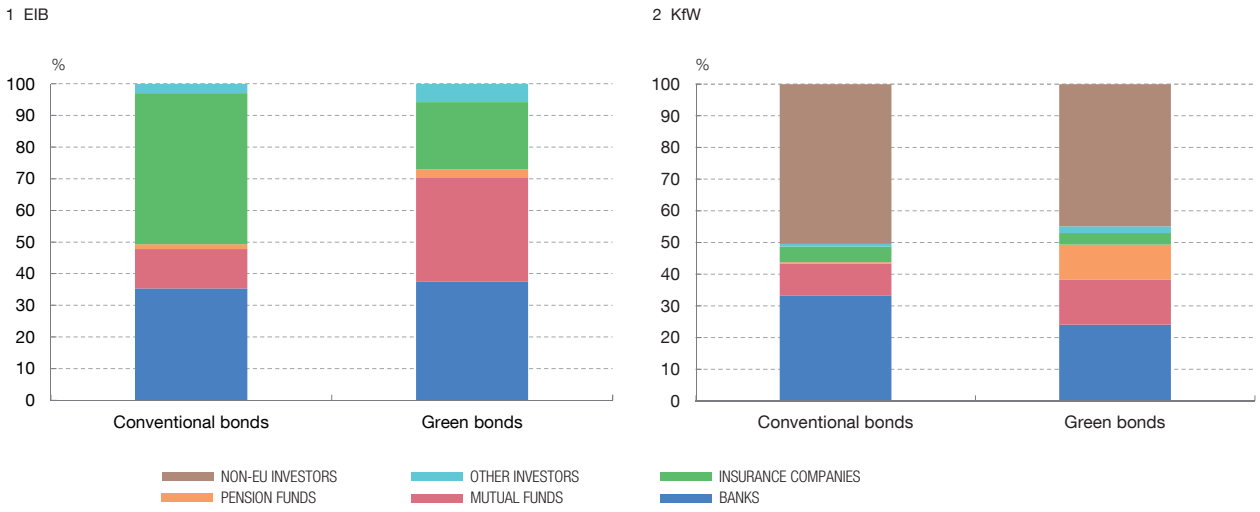
Alternatively, as indicated in Section 2, investors may already be considering sustainability as an additional factor to return and risk in the selection of their portfolios. If this is the case, the investor base for each type of asset can be expected to be different, depending on its sustainability appetite, in other words, on how much profitability it would be willing to forfeit or how much risk it would be prepared to assume to attain a higher level of sustainability in its portfolio. The case of green bonds issued by the same institutions as those issuing conventional bonds, with the same level of risk, is ideal for testing this hypothesis. Chart 10 shows how the green bonds of the EIB and KfW have a higher proportion of pension and investment fund investors than other bonds issued by the same institutions.

The differences in asset holdings may arise from diverse investment and pension fund mandates, which include restrictions on and incentives for the selection of portfolios. In practice, we have identified five possible strategies that investors might adopt to incorporate the sustainability factor into their investment portfolios [NGFS (2019b)]:

Chart 10

INVESTOR BASE BY SECTOR, ACCORDING TO THE TYPE OF BOND

Investors vary depending on whether they invest in green bonds or other types of bonds.



SOURCE: Securities Holdings Statistics by Sector.

i) *Negative screening.* This involves systematically excluding companies, sectors or countries that are controversial in terms of the sustainability from their investment channels.

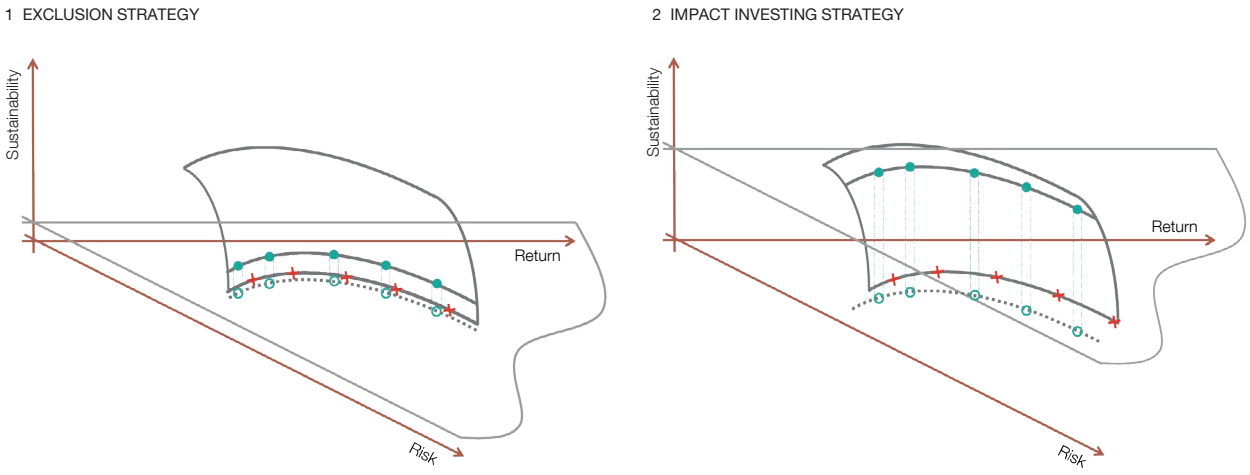
ii) *Impact investing.* This consists of creating specific portfolios investing exclusively in projects that are expected to have a positive impact on sustainability, particularly green bonds.

In the selection of portfolios, the qualitative implications of these two strategies are similar and consist of curtailing the universe of eligible assets. Thus, when viewed as a mathematical problem of optimisation, the selection of portfolios would seek a restricted optimal portfolio rather than an unrestricted optimal portfolio and the returns obtained would be the same as, or lower than, that of the unrestricted one. The investor's potential loss in terms of returns would be offset by sustainability gains. In quantitative terms, impact investing implies greater restrictions than the negative-screening strategy, and would therefore also entail greater trade-off between return and sustainability.

Using the efficient frontier diagram shown in Chart 5, the negative-screening strategy would involve replacing the projection on the zero sustainability plane observed with another in which the surface would be intersected by a slightly higher plane (to exclude less sustainable assets). With the new plane (see Chart 11.1), the selection of portfolios would be exactly the same as before, based on risk-return optimisation.

Chart 11

EQUIVALENCE ON THE RETURN, RISK AND SUSTAINABILITY EFFICIENT FRONTIER OF THE IMPLEMENTATION OF THE EXCLUSION AND IMPACT INVESTING STRATEGIES



SOURCE: Own data.

In the case of impact investing, the effect would be the same, except that the eligible assets would be those with a high level of sustainability, and the new projection plane would thus be far higher than that used in the negative-screening strategy (see Chart 11.2).

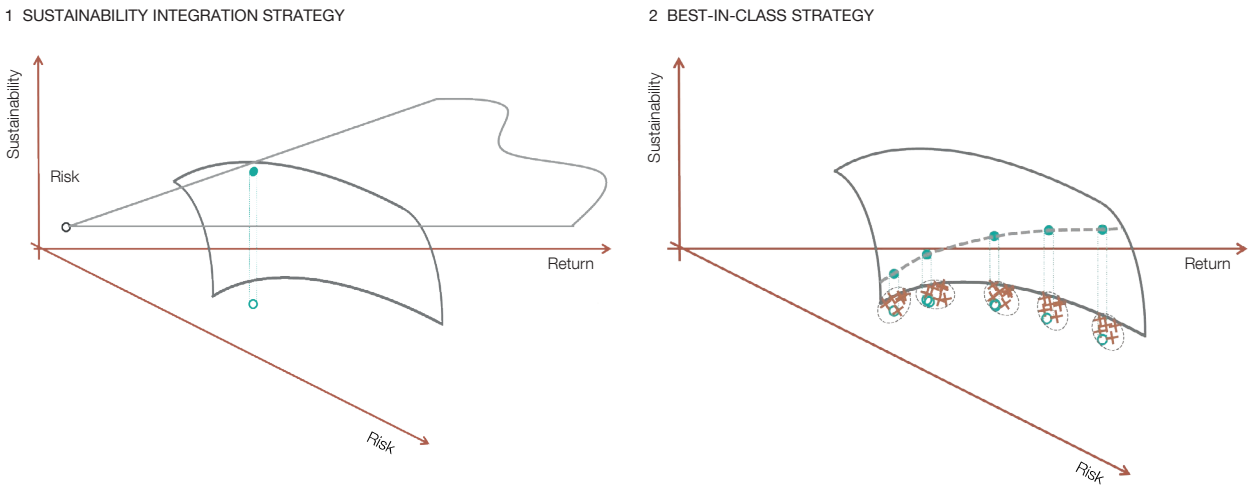
From a practical standpoint, both the negative screening and impact investing strategies are easy to implement in the current environment in which information on sustainability does not abound. All they require is clear criteria to identify which assets should be excluded from or included in the portfolio. Asset exclusion is common practice among many pension and investment funds and, generally, among investors concerned about reputational aspects (examples of excluded activities are arms, countries at war or countries that do not comply with certain criteria, highly polluting industries). As for impact investing, there are private initiatives that certify certain assets as green (for example, the Climate Bond Initiative has a list of green bonds certified by third parties). However, these criteria are not uniform and are open to criticism. As an alternative, official taxonomies for "green activities" are currently being prepared to enable the creation of impact portfolios (China already has one and the European Union's taxonomy is in the final approval stages).

iii) *ESG integration.* This includes sustainability as a third factor, along with return and risk, in the investment analysis.

iv) *Best-in-class.* This is a strategy whereby portfolios are selected in two stages. The first is the traditional selection of the types (and weights) of assets that will

Chart 12

EQUIVALENCE ON THE RETURN, RISK AND SUSTAINABILITY EFFICIENT FRONTIER OF THE IMPLEMENTATION OF THE SUSTAINABILITY INTEGRATION AND BEST-IN-CLASS STRATEGIES



SOURCE: Own data.

form part of the portfolio, according to risk-return criteria, and the second is the selection from among each asset type of those with a higher sustainability factor.

In theory, the incorporation of sustainability as a third factor in the selection of portfolios implies (in contrast with earlier criteria) that all assets are included in the potentially eligible universe. Thus, the efficient frontier would cover the entire surface of the three dimensions (return-risk-sustainability). A risk-free asset (one with no risk, normally a sovereign bond) and a given level of return (risk-free) and sustainability, generates a capital allocation plane (all the possible combinations between the risk-free asset and the portfolios on the efficient frontier surface), which will enable identification of the market portfolio as that in which the plane is tangential to the efficient frontier (see Chart 12.1).

All the above is simply the translation into portfolio theory of the existence of a third dimension in the selection of portfolios. In practice, the strategy would be applied by identifying the target sustainability level, as is done with the target risk level, to then search for the portfolio which maximises returns subject to the selected risk and sustainability levels. However, although application seems easy in theory, in practice, it is very complicated, at least for now, since it requires very clear sustainability metrics and their translation into a uniform standard of measurement. As we have explained in the previous section, this is still far from being the case, and therefore the high uncertainty about the sustainability of each asset in practice means that this is not a viable solution. In the case of equity portfolios, there is the option of considering the greenhouse gas emissions of

each firm as a measure of its sustainability (or lack thereof). However, when we try to extend this concept to fixed-income securities, the complexity increases. First of all, a criterion must be selected for assigning emissions between fixed-income securities and equities. In addition, fixed-income securities pose problems of their own. For example, in the case of covered bonds or asset securitisations, there are reasons for not considering the sustainability of the institution which issues them, but that of the assets backing the bonds. Determining the sustainability of risk-free assets is even more complex, since there are no clear or generally accepted criteria for allocating the carbon footprint to sovereign bonds [Gimeno (2020)].

The complications involved in the practical application of the strategy integrating sustainability have led to the use of the best-in-class strategy to address the problem. Identifying the most sustainable asset within a limited sub-set of assets is more straightforward than in the previous strategy, since it does not require comparing the sustainability criteria of very diverse assets such as covered bonds, sovereign or corporate bonds or shares, but only those within each sub-set. In theory, the best-in-class strategy generates an efficient frontier along the return-risk-sustainability surface which will intersect different sustainability planes (see Chart 12.2).

In practice, the best-in-class strategy also requires identifying what is to be understood by "best". Again, the lack of uniform criteria means that the interpretations vary, from those based on external assessments to others based on internal approaches such as the search for i) the best in the sector (leaders in terms of sustainability, owing to their smaller carbon footprint within the sector/asset class); ii) the best in terms of the transition (those who are reducing their carbon footprint the most within the sector); or iii) the best in the universe (only the highest-ranking firms, regardless of the sector).

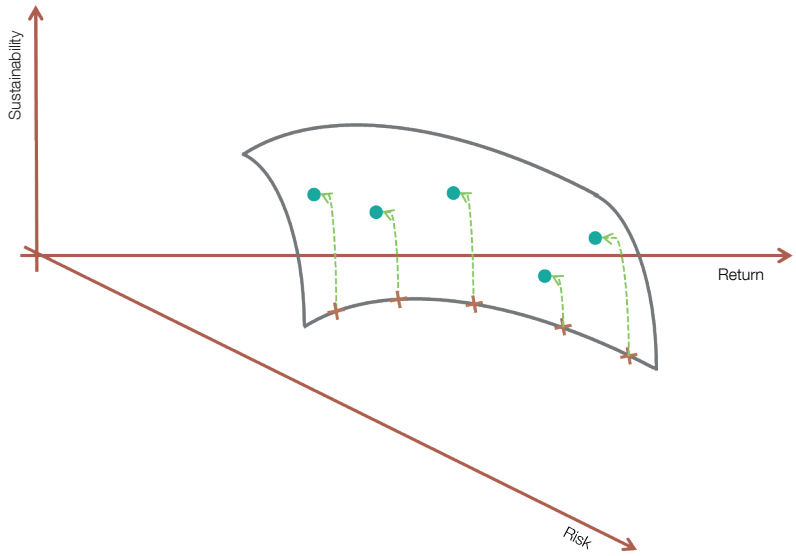
There is one last strategy that does not incorporate the sustainability factor in the selection of portfolios, but in the investor's subsequent actions:

v) *Voting and engagement.* This involves exercising ownership rights with the intention of changing a firm's behaviour on sustainability issues.

The voting and engagement strategy does not exclude any firm from the eligible asset universe. Even those which would be ruled out by a negative screening strategy are acceptable under the voting and engagement strategy. The aim is to exert all possible pressure as an investor to ensure that the firm adopts sustainability measures (see Chart 13). Naturally, to be effective, this strategy requires that investors are sufficiently large for the firm to feel compelled to make the changes requested/called for.

Chart 13

EQUIVALENCE ON THE RETURN, RISK AND SUSTAINABILITY EFFICIENT FRONTIER OF THE IMPLEMENTATION OF THE VOTING AND ENGAGEMENT STRATEGY



SOURCE: Own data.

6 Conclusions

There is growing social awareness of climate change risks and the need to take action. Financial markets are no exception to this phenomenon, and increasing attention is being paid to sustainability factors. The existence of a growing green bond market segment is evidence of this. This article shows the increasingly negative trend of the greenium, from 2 bp reported in previous papers to 6-8 bp estimated in 2019. In fact, growing demand for this type of asset may lead to the continued growth of this negative greenium, which favours green bonds. In addition, we have shown that the preference for green assets is not limited to fixed-income securities, but that there is also a growing appetite for equities, as a result of which firms with a smaller carbon footprint have had a better stock market performance than those with a larger footprint.

Taking a traditional financial approach, in terms of return and risk, if two assets with the same level of risk offer different returns, the one with a lower return would, in principle, be less attractive. Therefore, the existence of a negative greenium would mean that investors would be less interested in these assets. However, the increasing pace of growth of this market segment, along with strong demand for such assets, raises the question of trying to find a way of reconciling the two aspects. On one hand, sustainable assets may be thought to provide better protection against the risk of climate change, and that firms implementing measures to address the transition to a sustainable economy will, in the long run, find it easier to adapt and thus obtain

greater returns. This implies that, when comparing the risk-return profile of the two hypothetical assets mentioned above, we would actually be saying that the greener asset has a lower level of risk and thus, the required rate of return on the market is lower. However, there are reasonable doubts as to whether investors can effectively include climate risks in their risk-return assessments. First, the climate risks we are referring to are unprecedented, and there are no observed past references that could be included in the econometric models to assess risk. Second, the qualitative inclusion of these risks, similar to that applied to credit risk by rating agencies, is subject to much uncertainty, since it is in the early stages, and the indicators are thus very mixed. Lastly, the differences between investment horizons and those of the potential materialisation of climate risks make their inclusion in risk assessment less likely.

It can therefore be argued that certain investors opt to include sustainability factors in their investment decisions regardless of the return-risk factors of these financial assets. Accordingly, when selecting their portfolios, agents would be optimising a utility function with three variables (return, risk and sustainability) instead of two (return and risk). Thus, investors might be willing to forfeit some returns on their portfolios if sustainability is improved. In the last section of this article, we have explored, from a theoretical standpoint, the different strategies investors may use to include this third factor of sustainability in their portfolio selection. However, all these strategies are possible approaches to the problem and will continue to be imperfect solutions until the quality of the information on the sustainability of assets improves and is at least comparable to that available to investors on those same assets' risk and return.

Finally, it is worth noting that this study is limited by the fact that it concludes at the end of 2019, and does therefore not reflect the economic and financial impact of the pandemic on investor attitudes. The materialisation of totally unexpected risks for investors, for which there is no historical precedent in the past century, has similar connotations to what we have discussed earlier with respect to climate change. It is therefore reasonable to ask ourselves whether the pandemic has led investors to rethink the way they incorporate this type of risk into their investment decisions; whether the three-pronged approach of ESG investment now includes, in addition to the environmental aspect raised in this article, the social aspect, with all the funding needs of states and firms to address the problems generated by COVID-19; whether the proliferation of social bond issues are going to crowd out green bonds, or if, instead, they are going to contribute to driving the latter out of their market niche to become standard bond issues. These are all legitimate questions that will help define future avenues of research.

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