

THE ELEPHANT IN THE ROOM

ALIGNING GLOBAL BONDS MARKETS WITH CLIMATE GOALS



DISCUSSION PAPER
JUNE 2018

ABOUT 2° INVESTING INITIATIVE. The 2° Investing Initiative (2°ii) is a not-for-profit think tank working to align the financial sector with the 2°C climate goal and long-term investing needs. With offices in Paris, London, Berlin and New York, the Initiative engages a global network of over 100 partners and members, including 100+ financial institutions, investment consultants, asset managers, policymakers, research institutions, academics and NGOs. Our work primarily focuses on three pillars of finance - metrics and tools, investment processes, and financial regulation. Since launching in 2012, 2°ii has advanced the state-of-the-art across both technical and policy issues, notably through:

- Co-initiating the first climate disclosure regulation for institutional investors in France (Art. 173 in 2015), as well as partnering with two European financial supervisory authorities on 2°C scenario analysis and stress-testing of their regulated entities;
- Developing an open-source, IP-rights free 2°C scenario analysis tool for equity and bond investors, applied by over 200 institutional investors to date, and supported by the Swiss government;
- Launching an ISO standardization process around financial institutions' climate disclosure;

Authors: Jakob Thomä, Michael Hayne, and Vitaliy Komar, with the editorial support of WWF

Cover page: David Blackwell (<https://www.flickr.com/photos/mobilestreetlife/4179063482>) .
Licensed under Creative Commons

The project benefited from the financial support of WWF-Sweden and the LIFE NGO Operating Grant

The views expressed in this report are the sole responsibility of the authors and do not necessarily reflect the views of the sponsors.



Contents

1. An overview of the global bonds market	8
<i>a. Market overview</i>	8
<i>b. Distinguishing features</i>	9
<i>c. The role of bonds in financing the transition to a low-carbon economy</i>	11
2. Bond by bond, issuer by issuer	13
<i>a. Government bonds</i>	13
<i>b. Asset-backed securities</i>	15
<i>c. Corporate bonds (financial and non-financial)</i>	16
3. Climate goal alignment and corporate bonds transition risk	18
<i>a. Climate goal alignment of financial portfolios</i>	18
<i>d. Transition risk in corporate bonds markets</i>	22
4. Challenges	24
5. Conclusion and potential for action	25

EXECUTIVE SUMMARY

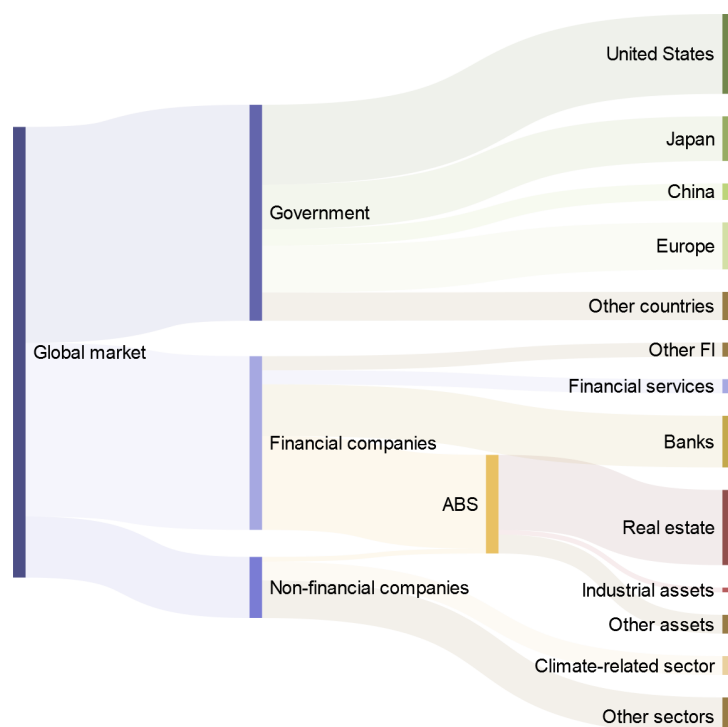
Bond markets – representing the largest asset class in capital markets – are critical in the context of achieving the Paris Agreement.

The global bond market is roughly \$100 trillion globally – roughly three times the size of the EU and United States GDP combined – and it’s been growing by a factor of ten since the early 1990s. Bond markets are a critical source of capital for governments, companies, and financial institutions. Their advantage is lies in the relatively long-term tenor of the debt instrument, as well as the market’s liquidity, reducing financing costs. For securitized instruments, they help institutional investors be exposed to household credit (e.g. through mortgage-backed securities) and banks refinance themselves in the context of providing this credit. In its role as a core pillar of capital markets, bond markets can also play a key role in financing the transition to a low-carbon economy.

Despite their importance, the discussion of bond markets has largely focused on the green bond space, which currently represents a marginal share(<0.5%) of outstanding bonds. This paper focuses on creating a broader understanding of the interface between climate goals and bonds.

Ensuring the contribution of global bonds markets to climate objectives requires a more holistic view across bond instruments. The figure below seeks to approximate what that ecosystem looks like by issuer and type of instrument. Beyond differences in issuer (financial, non-financial, government), bonds also differ across key criteria that represent investment constraints for investors. First, bond instruments mature on average every seven years and thus investors are required to evolve their portfolio continuously – either by refinancing the entity or investing in alternative securities. Second, the ability for investors to hold bond securities is driven to a significant degree by its credit rating, which determines both potential capital requirements as well as the optimization of the risk profile of the portfolio. Finally, the currency is key in terms of relating to the asset-liability management of an investor.

Figure 1 Breakdown of global bond market by issuer and instrument (Source: Authors, based on Bank for International Settlements, Bloomberg, and own estimates)



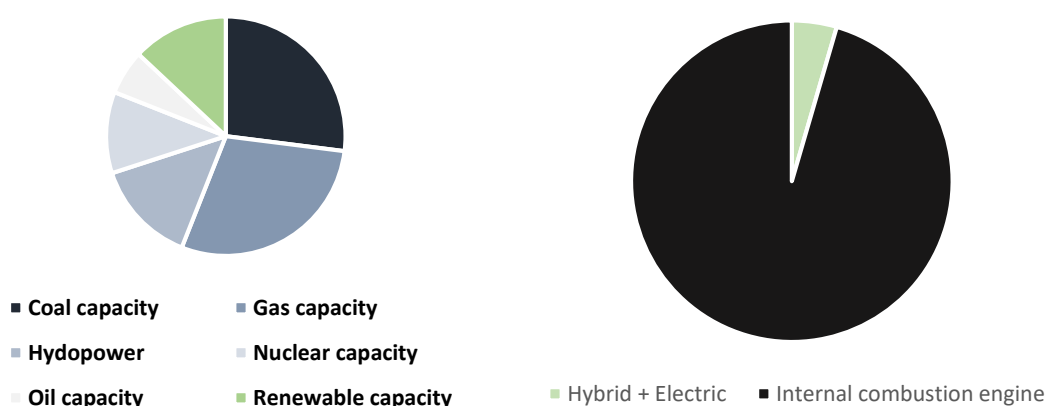
Different types of bonds serve different functions in the bond ecosystem:

Government. Governments represent the largest issuers of bonds, but also the most ‘diffuse’. To date, the interface between climate impact and sovereign bonds is still relatively confused. Sovereign debt issuance is dominated by developed market economies. The 10 largest issuers of governmental debt (at national level) account for over 90% of the sovereign bond market, with Japan and the United States by themselves taking up 50% of the share. While markets are liquid, the number of issuers for all intents and purposes is relatively constrained to developed market economies. From a financing perspective, despite the size of the bond market, bonds actually make up a relatively small part of the financing source for most governments, in particular in normal economic conditions. Currently, three types of approaches exist for climate assessments of sovereign bonds: The carbon footprint of a country, the climate policy of a country, and the investment footprint of the state.

Asset-backed securities. Asset-backed securities are a critical source of financing for two key high-emission sectors: real estate and automobile. The asset-backed security (ABS) market is dominated by real estate, representing more than 95% of the market. Other types of prominent assets in this market include automobile loans, credit card debt, and student loans (2° Investing Initiative 2018). Asset-backed securities – given their links with real assets – allows (in theory) for a high degree of transparency. Moreover, the use of proceeds are clear in this asset class, at least with regards to the assets being refinanced. Climate assessments for ABS are still limited, but have significant future potential. The Climate Bonds Initiative has just issued its guidance on real estate green bonds (CBI 2018). While this guidance focuses on green bonds, it can also be adapted to analysing financial instruments more generally.

Corporate bonds (financial and non-financial). Corporate bonds are the universe of bonds issued by financial and non-financial companies that are linked to their balance sheet (thus not asset-backed securities or project bonds). In terms of breakdown, nearly half of all corporate bonds are issued by financial institutions. For corporate issuers, the challenge is penetrating the sectoral level. Similar for equity, sectoral estimates can be used as a proxy for overall exposure to economic activities covered in 2°C scenarios, however they fail to reflect on whether these activities are high-carbon or low-carbon. A more specific analysis is thus needed, penetrating the sectoral level and providing information on both the company and asset level, based on asset-level data. The figures below show the fuel mix of the power and automotive sectors. More detailed forward-looking alignment analysis is also provided in this report.

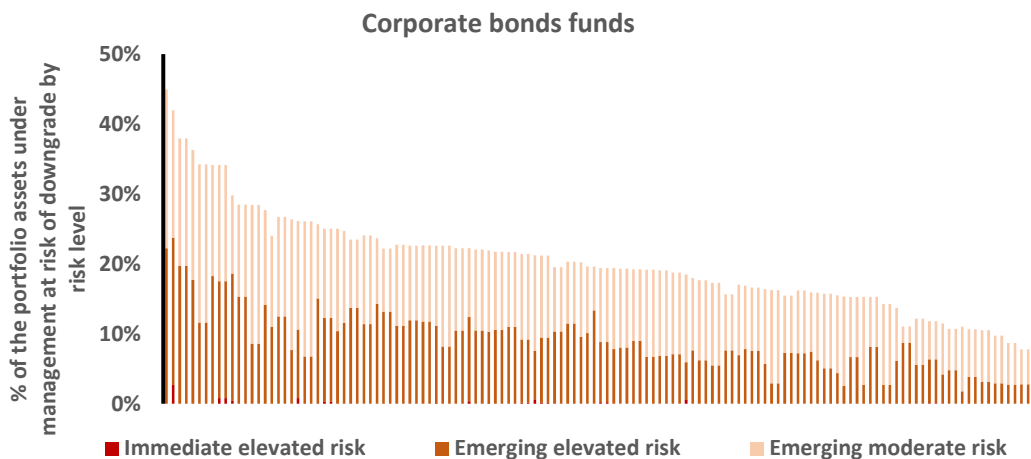
Figure 2 The fuel mix of the power sector and the automobile sector of the global corporate bonds market in 2018 (Source: Authors)



Beyond aligning financial markets with climate goals, the transition to a low-carbon economy may also constitute a financial risk.

As outlined above, bonds may be less exposed to these risks in the short-term, given their maturities and position in the capital stack. Nevertheless, exposures to these trends exist. The figure below highlights the share of the corporate bonds portfolios of Swiss pension funds that, according to analysis by Moody's, is exposed to sectors with immediate elevated, emerging elevated, or emerging moderate risk of downgrade. This analysis, it should be noted, extends to a broader suite of environmental risks, not just limited to climate.

Figure 3 The share of environmental risk sectors in the portfolios of Swiss pension funds



Three key accounting challenges remain in the market

- **Use of proceeds information.** As outlined above, the concept of use of proceeds is largely missing in the sovereign bonds space and limited to refinancing in the case of asset-backed securities (with uncertainties as to what the refinancing proceeds will be invested in in the future). For corporate bonds, uncertainty remains given the high-level information and the uncertainty around the concept of 'ringfencing'.
- **'Missing sectors'.** Asset-level data helps expand the universe of assessable assets. At the same time, the scope of assessment focuses on the asset activities only and don't extend to issues like R&D and energy efficiency. It also currently doesn't extend to other climate-relevant sectors like agriculture and forestry, chemicals, and glass.
- **Allocating economic activity to financial assets.** The question of how to allocate economic activity to financial assets remains open with two options starting to crystallize – the 'balance sheet' or 'portfolio-weight' approach

The report concludes with a discussion of potential actions, including providing / withholding capital, influencing pricing, and engagement.

It highlights the potential approaches and case studies for each of the three examples. The key challenge is the limited evidence as to the relative impact of these actions to each other, creating uncertainty as to the right step for investors to take. Building that evidence-base is crucial as part of a period of data-driven and evidence-building experimentation in order to mobilize the power of global bond markets in the service of climate objectives.

I. Introduction

Bond markets represent the largest asset class in capital markets.

While fluctuating in value, the size of the global bond market is roughly \$100 trillion globally and it's been growing by a factor of ten since the early 1990s. By comparison, the global stock market capitalization in 2015 was \$67 trillion.¹ Bond markets are a critical source of capital for governments, companies, and financial institutions. Their advantage lies in the relatively long-term tenor of the debt instrument, as well as the market's liquidity, reducing financing costs. For securitized instruments, they help institutional investors be exposed to household credit (e.g. through mortgage-backed securities) and banks refinance themselves in the context of providing this credit.

They are critical in the context of Art. 2.1c, given their prominence in financial assets.

In its role as a core pillar of capital markets, bond markets can also play a key role in financing the transition to a low-carbon economy. The market size suggests the potential in mobilizing the deep capital pool of asset owners for transition financing. At the same time, the prominence also suggests bond markets warrant a particular focus in the context of delivering Art. 2.1c of the Paris Agreement, specifically to align global financial flows with the Paris Agreement climate goal. Finally, bond markets may also harbour transition risks related to the decarbonization of the economy.

"...we hope to highlight how fixed income investors can support the broader responsible investing agenda and, ultimately, help move us towards the common goal of unlocking the multi-trillion-dollar universe of core fixed income capital to influence positive change." **Scott Mather**, CIO, Core Strategies, PIMCO ²

Despite their importance, the discussion of bond markets has largely focused on the green bond space, which currently represents a marginal share (<0.5%) of outstanding bonds and will remain a minor segment of the bond market in the foreseeable future.³

The conversation in equity markets has focused on developing a more holistic portfolio view on aligning portfolios with climate goals and potential financial risk associated with the transition to a low-carbon economy. The equivalent conversation in bond markets has taken a different turn.

This paper seeks to expand the discourse by exploring the interface between the transition to a low-carbon economy and bond markets more broadly.

New data sources, notably asset-level data, and access to broad market data on the global bonds markets, as well as developments in research on climate accounting issues, have started opening up this space. The Swiss government pilot project on 2°C scenario analysis, conducted in 2017 with two-thirds of the Swiss pension funds and insurance market for example – provided the first government-led initiative on corporate bonds assessment.

AXA IM pioneered the first corporate bonds 2°C scenario analysis reporting in 2016, recognized by the French government-led Award on Climate-related Disclosures. This new focus provides an opportunity for a broader integration of climate issues in corporate bonds markets and portfolio management. It is this focus that is at the heart of the discussion in this paper.

¹ WFE statistics <http://www.world-exchanges.org/home/index.php/news/world-exchange-news/wfe-full-year-statistics-show-2015-global-equity-trading-volumes-rise-55-as-volatility-boosts-activity>

² "ESG engagement for fixed income investors", PRI (2018)

³ "... by 2035 in a 2DS, bonds for low-carbon energy investments have the potential to scale to as much as USD 4.7-5.6 trillion in outstanding securities globally and USD 620-720 billion in annual issuance in the markets studied. While these figures may seem large on an absolute basis, they are small (approximately 4%) relative to the scale of issuance in debt securities markets generally." (OECD 2016).

1. An overview of the global bonds market

a. Market overview

What can be called the global bond market is in fact a an ecosystem of fundamentally different instruments, serving very different functions.

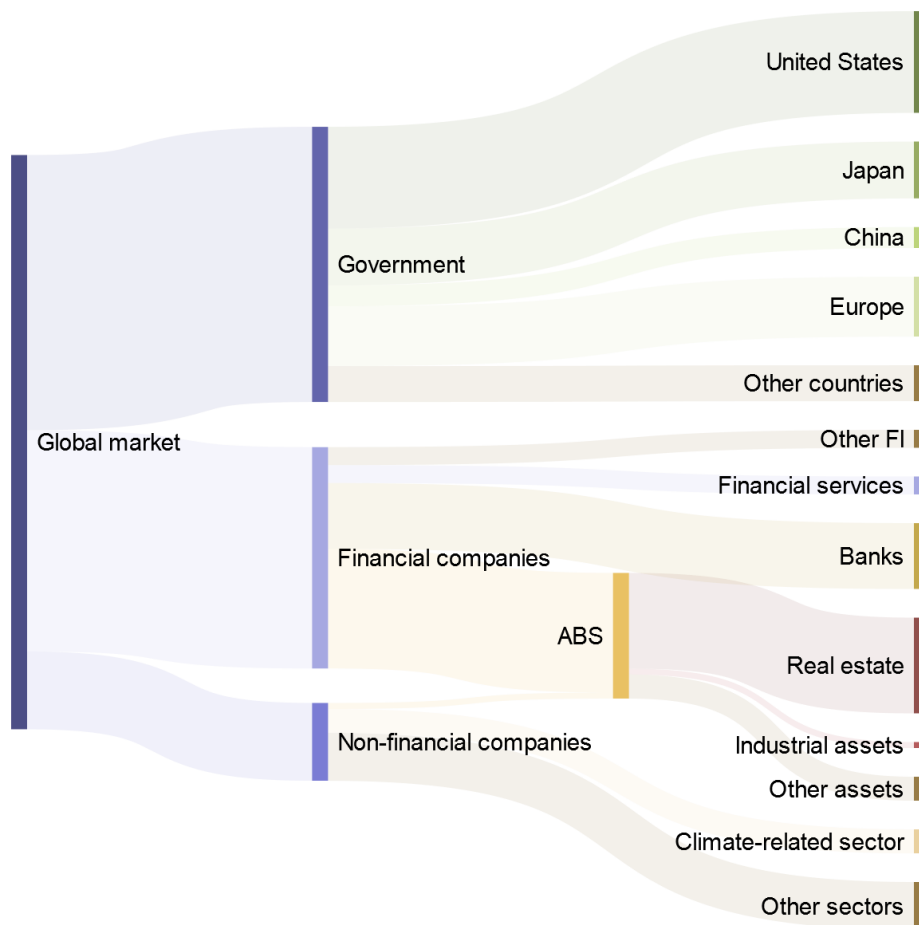
This ecosystem is a function of both the range of issuers operating in bond markets (government, state-owned enterprises, non-financial companies, financial institutions) and differences in the contract structure underlying bonds (e.g. general purpose bonds, covered bonds, asset-backed securities), as well as their use of proceeds.

This implies by extension that there isn't necessarily one global narrative or thread tying all of these instruments together. Indeed, in some respect each of these instruments should be considered their own asset class, each playing a distinct role on the question of climate and bonds markets.

The figure below seeks to approximate what that ecosystem looks like by issuer and type of instrument, based on a combination of data from Bloomberg, Bank for International Settlements, and analysis of the authors.

The next pages will discuss each of these instruments in further detail. The figure shows that the bond market is dominated by government and financial companies issuance, with only a small share (~20%) related to non-financial issuers.

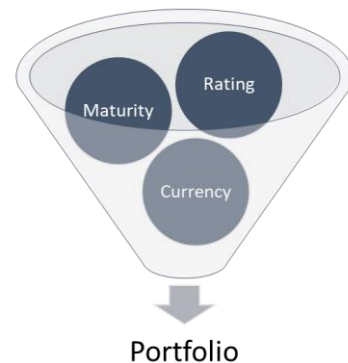
Figure 4 Breakdown of global bond market by issuer and instrument (Source: Authors, based on Bank for International Settlements, Bloomberg, and own estimates)



b. Distinguishing features

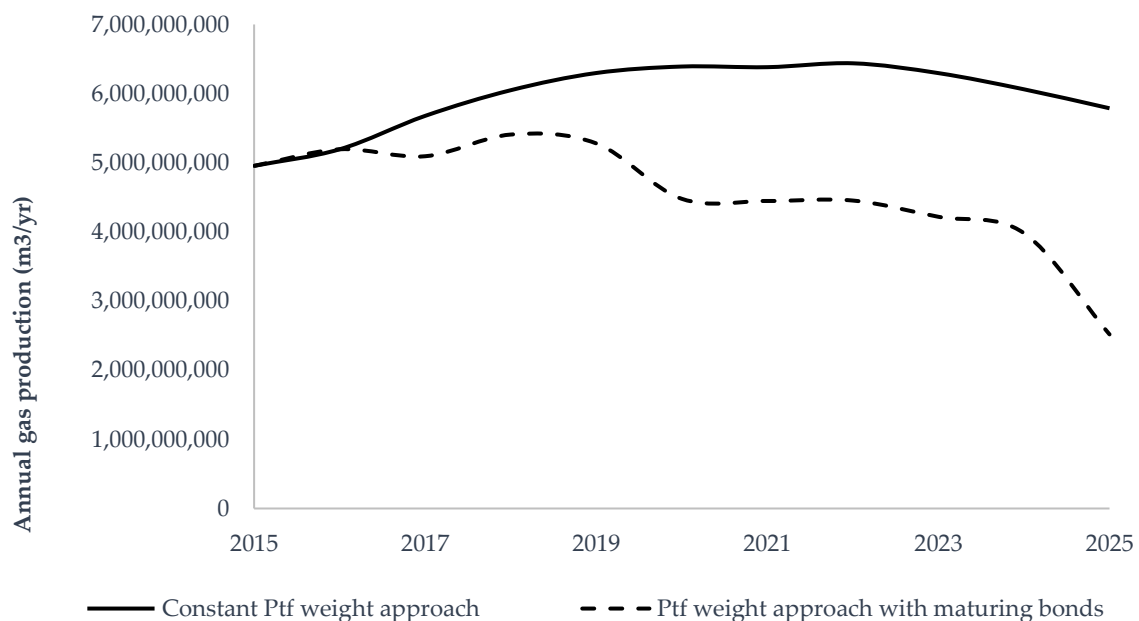
A discussion of bonds needs to highlight a few characteristics and constraints that investors face when investing in these instruments.

For bond investors, there are a number of key constraints when investing in different instruments. First, bond instruments mature on average every seven years and thus investors are required to evolve their portfolio continuously – either by refinancing the entity or investing in alternative securities. Second, the ability for investors to hold bond securities is driven to a significant degree by its credit rating, which determines both potential capital requirements as well as the optimization of the risk profile of the portfolio. Finally, the currency is key in terms of relating to the asset-liability management of an investor. Each of these aspects will be discussed in turn.



- **Maturity.** Debt instruments are based on contractual time frames. Bond portfolios thus by design face a natural wind-down of asset exposures that require the portfolio manager to purchase new bonds. This stands in contrast to listed equity portfolios that hypothetically could be held until eternity. Depending on the portfolio and the maturity of the instruments, the natural wind-down of exposures differs. An illustrative analysis of a corporate bonds portfolio suggests that exposures may drop by around 50% to gas production for example within the span of just 10 years, simply by not ‘refinancing’ the bonds that mature naturally. Maturity of exposures also has implications for the discussion of risk and the financing footprint.

Figure 5 The exposure of an illustrative portfolio to gas production assuming constant and changing portfolio weights based on a typical maturity profile (2° Investing Initiative 2018)



- **Currency.** Each debt instrument is linked to a specific currency. This makes the value of the repayment directly linked to the value of the currency. If a European pension fund invests in a US-Dollar denominated bond in a context where the US-Dollar loses 20% of value, the value of the repayment (in Euro terms) drops as well.⁴ In practice, upwards of 90% of outstanding debt is issued in US-Dollars, Euro, Pounds, Yen, or Canadian Dollars. Chinese-Reminbi denominated debt meanwhile is quickly gaining market share. The implication of this however is that certain low-carbon or high-carbon debt exposures may be associated with currencies that do not fit into the investment mandate of the investor and / or the liability profile.
- **Use of proceeds.** In bond markets, various bond instruments may be associated with specific use of proceeds. Analysis of Bloomberg data in this respect suggests that a little over 50% of bonds issued by financial institutions and companies⁵ were tagged with use cases, with the largest shares related to ‘refinancing’, ‘investment’, and ‘financial’ (e.g. stock buyback) uses. One specific use of proceed that has grown in terms of labelling is the ‘green bond’ market. While they face specific use cases, they are not strictly speaking ‘ring-fenced’ that is to say the bond issuance is associated with a certain objective that is however not legally enforceable, nor from an accounting perspective technically constrained. Bonds tagged as being issued for ‘refinancing’ thus provide capital to a company the same way a general purpose bond would. A small sub-section of bonds however will actually be technically ring-fenced, where the proceeds are ‘fenced off’ from the rest of the balance sheet. In the case of ‘green bonds’ for example, this figure is about 5%.⁶

Box 1: What does ringfencing actually mean in practice?

One challenge with proper ringfencing is the extent to which it requires companies to ‘trap’ cash in certain structures, thus reducing flexibility. Depending on the guarantees of the bond, project bonds may have a higher risk and thus increase the cost of capital for issuers relative to general purpose bonds that sit on the balance sheet of a company. This conflict between ‘ringfencing’ may be a challenge. In some cases, bonds ‘virtually’ ringfence use of proceeds in terms of targeted use, while still using the full corporate balance sheet. This is described as virtual since there is no legal ringfencing. This is the case even if the volume of proceeds is committed to be equivalent to the volume of investment in green on the other side of the balance sheet. By extension, ‘virtual ringfencing’ of bonds, where there is merely a commitment to invest the proceeds, even as the bond finances the whole entity, exposes the buyer of the bond to the risks of the entire balance sheet of the issuer. Any benefits with regard to costs of capital thus accrue to the company as a whole.

- **Ratings.** One final key aspect when thinking about the bond market is the prominence of ratings. Bond ratings are the lighthouse in terms of orienting capital flows in bond markets. They are used as a supervisory tool in capital reserve requirements, the constrain the universe of assets in which a bond investor can invest (investment grade vs. non-investment grade) and the cost of capital a company faces when issuing bonds.

⁴ Obviously, financial institutions can seek to hedge some of this risk through derivative markets or even through the fact that the value of debt in other currencies goes up.

⁵ Excluding asset-backed securities.

⁶ 2° Investing Initiative (2018) “Shooting to the Moon in a Hot Air Balloon: Measuring how green bonds contribute to scaling up green investment”

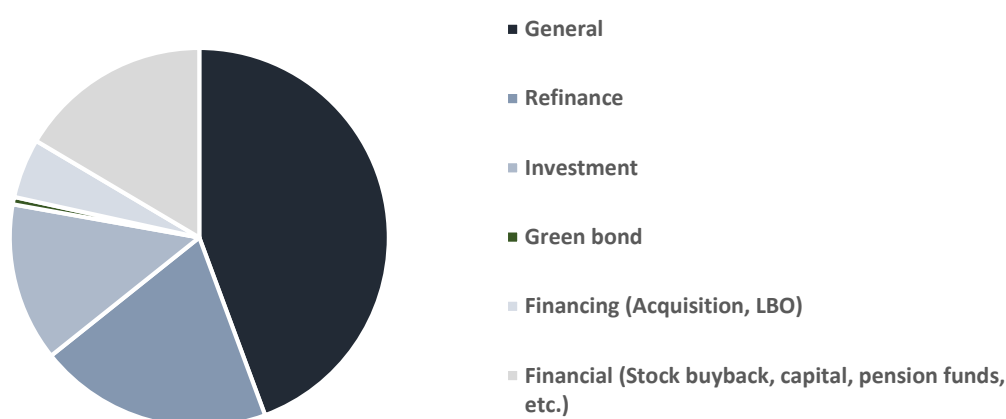
c. *The role of bonds in financing the transition to a low-carbon economy*

Bonds can play a role both in primary and secondary financing in the context of the transition to a low-carbon economy.

Understanding the role of bonds in financing the transition to a low-carbon economy requires an understanding of the use of proceeds associated with bonds financing. For asset-backed securities, bonds represent a pure refinancing instrument (intuitively, since the transaction needs to have been concluded to count as collateral). On the flipside, government-financing in bonds market is almost exclusively a debt-raising mechanism designed to cover running deficits in government budgets. Green bonds issued by municipalities and governments represent notable exceptions to this rule.

For corporate bonds, the use of proceeds picture is somewhat more nuanced. The figure below highlights the different proceeds to which bonds are earmarked, almost half of which are simply tagged as 'general'. It should be noted that around a quarter of bond financing is focused on financing or financial use of proceeds. Use of proceeds related to acquisitions arguably have a different footprint than investment because they primarily focus on shifting ownership structure, rather than adding to the capital stock. In turn, the data also highlights the prominent role of refinancing in bond markets. The challenge here is that roughly 50% are labelled as general financing without specific information associated with these instruments.

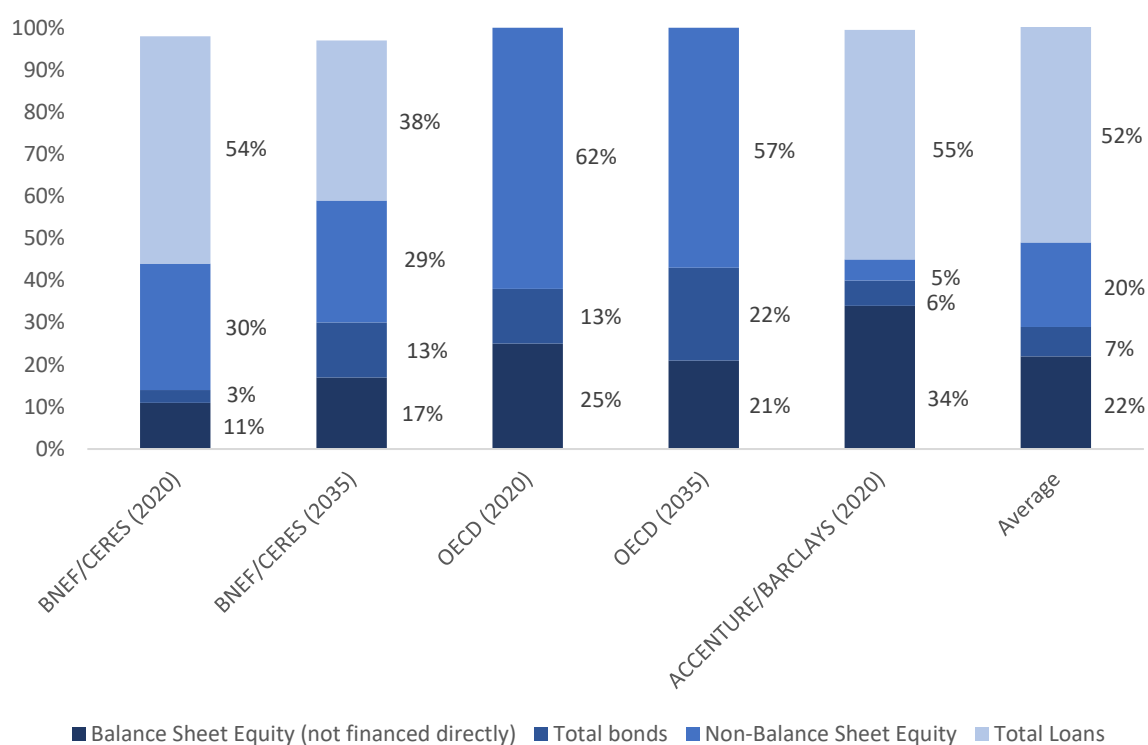
Figure 6 Use of proceeds of bonds, excluding sovereign and asset-backed securities (Source: Authors, based on Bloomberg data on corporate bonds)



The impact of bonds can articulate itself on both primary and secondary markets:

- **Role in primary financing.** When discussing the role of bond financing in the transition towards climate stabilization, it is critical to disentangle primary and secondary financing. The limited analyses that seek to map financing needs related to a 2°C scenario (“financing roadmaps”) suggest bond markets only play a limited, albeit increasing, role for power investment for example. Thus, Accenture estimates that bond financing only represents around 5% of the financing source of power investment by 2020, looking at the European market (Accenture 2012). The OECD, taking a global view, and being the most optimistic in the literature, still sees that number peak at around 20% by 2035, with research by BNEF / Ceres for the US power market at around 10-15%. Analysis by the International Energy Agency in the World Investment Report (2016) – again with a global scope - similarly finds only a limited role for bonds, although the analysis is not forward-looking. Another factor here is that bond investors are generally at the bottom of the capital stack,

Figure 7 Breakdown of power financing by financing roadmap (2° Investing Initiative 2017)



- Role in secondary financing.** At the same time, bond markets can play a key role in the context of refinancing. Asset-backed securities related to automobile loans for example represent a significant share of the securitization market. Financial institutions, responsible for around 50% of the financing source for power investments through their lending activities, tap into bond markets as a primary source of refinancing. Companies involved in significant infrastructure investments may do the same. On the high-carbon side, oil and gas companies have also increasingly tapped into bond markets, which increases the exposure in bond markets to these companies.

Beyond the role of bonds in contributing to the transition, they also interface with climate change from a risk perspective.

In this perspective, bonds may face transition risks. As a rule however, given the position of bonds at the bottom of the capital stack, they are less exposed than equity instruments to these types of risks. Moreover, bonds have a fixed maturity, which is frequently more short-term than for equity, suggesting that the cash flow underpinning current securities is less long-term than for equity investors.⁷ This point may be counter-intuitive. To be clear, it doesn't relate to the actual trading frequency of the instrument, but rather the maturity of the cash flows that represent the store of value underpinning the asset price.

One relevant risk to highlight however is not just the risk of default, but potentially the risk of a rating downgrades, which will impact credit spreads and to which degree the downgraded bond is accepted as collateral in other financing transactions, notably in relation with central banks.

⁷ See for example 2° Investing Initiative (2017) "All Swans are black in the dark"

2. Bond by bond, issuer by issuer

a. Government bonds

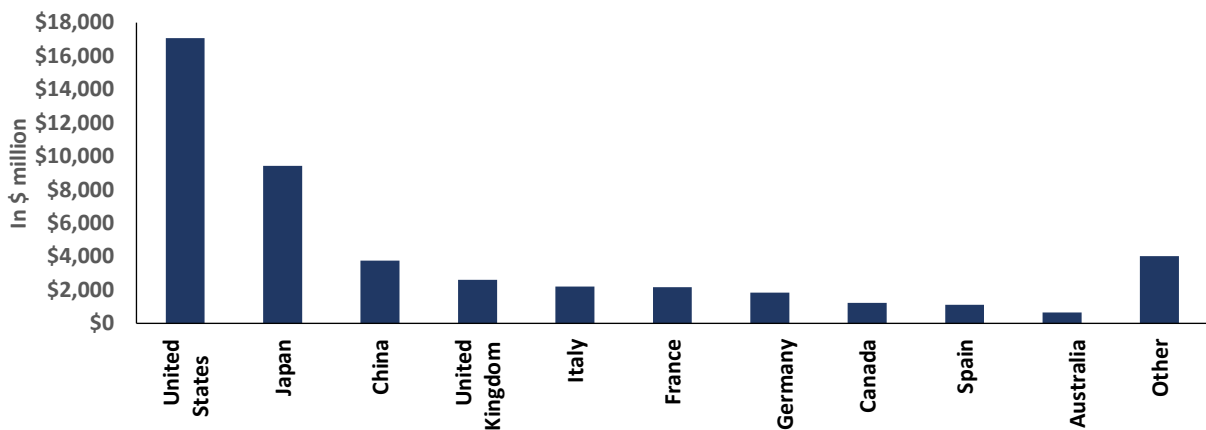
Governmental issuers play the most prominent role in bonds markets, accounting for nearly 50% of all outstanding bonds.

They are represented both directly through the issuance of sovereign debt, as well as debt issued by federal states, municipalities, and cities, as well as indirectly through their ownership of entities that issue their own bonds (e.g. state-owned enterprises, banks, agencies), although in that case the instruments may be classified as a financial or non-financial company, depending on classification system. Governmental issuers in turn may operate at federal, state, or even municipal level.

To date, the interface between climate impact and sovereign bonds is still relatively confused.

Sovereign debt issuance is dominated by developed market economies. The 10 largest issuers of governmental debt (at national level) account for over 90% of the sovereign bond market, with Japan and the United States by themselves taking up 50% of the share (see Fig. below). While markets are liquid, the number of issuers for all intents and purposes is relatively constrained to developed market economies.

Figure 8 Breakdown of governmental issuer by country (Source: Authors, based on Bloomberg)



From a financing perspective, despite the size of the bond market, bonds actually make up a relatively small part of the financing source for most governments, in particular in normal economic conditions.

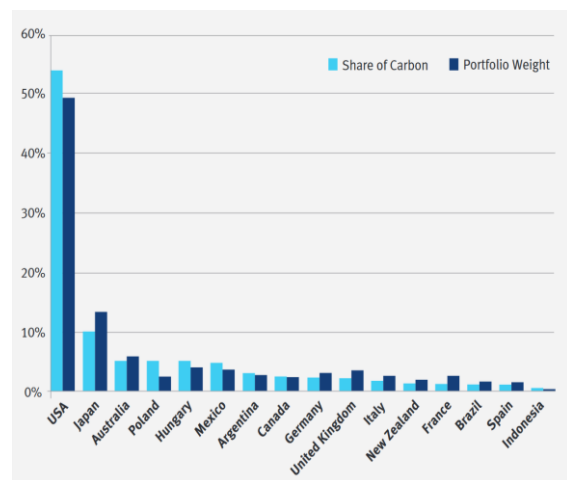
Government debt may be in the order of its country's total GDP, and in the case of Japan over 200% of GDP, but the annual deficit – that is the part of the government spending that needs to be filled through bond issuance – tends to hover at less than 3%. Of course, the higher the deficit, the larger the dependence on stock markets. Indeed, this 3% debt limit is part of the Maastricht Treaty for EU member countries, admittedly a constraint not always respected. On the flipside, the need to 'refinance' the bonds over time creates a significant susceptibility of governments to bond markets.

In terms of climate assessments, as issuance of government bonds is largely constrained to refinancing past capital provision. Without clear accounting as to which capital provisions are still being refinanced by new bonds issuance, the explanatory power of assessment frameworks is limited.

Three types of approaches in the literature or in practice can be identified to date:

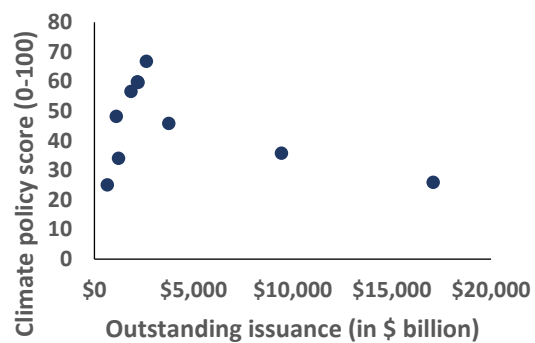
Carbon footprint of the country: This approach simply considers a sovereign bond an investment in the country and thus takes the country's carbon footprint (including or excluding trade balance) or carbon intensity / GDP as a climate metric. This choice conflates the government with the country itself, thus double-counting the responsibility. This ignores the actual climate policy underpinning the government's balance sheet and its role in international and national climate diplomacy. The figure on the right provides an example for the application of this approach on the Blackrock Global Allocation Fund.

Figure 9 Country portfolio weights and portfolio carbon intensity (in %) for the BlackRock Global Allocation Fund



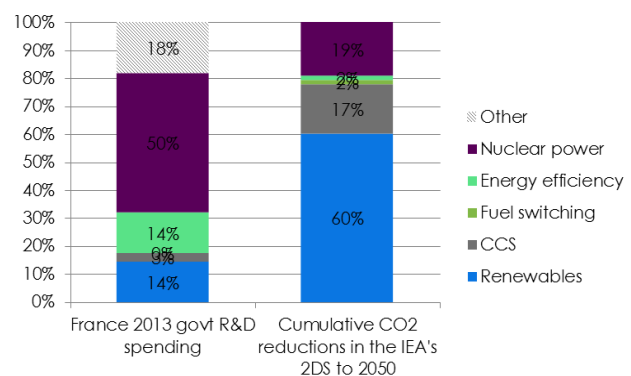
Climate policy of the state: This approach ignores the balance sheet of the country and seeks to discriminate countries based on their climate policies. It thus suggests that the footprint of a bond is expressed in the policy framework it endorses and that this aspect of a governmental issuer is the most important. Such a framework obviously requires a qualitative assessment system and ranking of different governmental climate policies, such as those developed by the Germanwatch / NewClimate Institute (see Fig. on right).⁸

Figure 10 Climate policy score of a country and outstanding issuance (Source: Authors based on CCCPi and BIS data)



Investment footprint of the state. The third approach identified in the literature takes the original principle of Art. 2.1c and seeks to focus on the actual 'use-of-proceeds' of the sovereign bond as it is reflected in the capital allocation decisions of the issuer. Undoubtedly, this is technically the most complex approach, since it requires an analysis of a governments balance sheet, a breakdown of its public spending and the identification of 'investments' among those expenses. It has previously been applied by CAF and Ecofys (Dupré et al. 2013).

Figure 11 France 2013 government R&D spending by sector versus CO2 reduction needs in IEA 2D Scenario (Source: Beyond Ratings 2016)



While the overall complexity may raise questions as to its general applicability, certain core indicators may be isolated that play a prominent role. Thus, the government's spending for example is a key potential source of fundamental R&D for breakthrough technology. Sovereign bonds analysis could compare governmental R&D expenditure for example with emissions reduction needs.⁹

⁸ Add reference end preferably link to a website for easy access to explore further.

⁹ Direct R&D scenarios unfortunately are no longer produced by the International Energy Agency.

b. Asset-backed securities

Asset-backed securities are a critical source of financing for two key high-emission sectors: real estate and automobile.

The asset-backed security (ABS) market is dominated by real estate, representing more than 95% of the market. The real estate sector in turn plays a prominent role in GHG emissions accounting, representing around 6-7% of direct annual GHG emissions and another 12% when considering indirect CO₂ emissions. Other types of prominent assets in this market include automobile loans, credit card debt, and student loans (2° Investing Initiative 2018).

Given both the relative transparency of the instruments underlying asset back securities, as well as the known use of proceeds, ABS's can lend themselves in two ways:

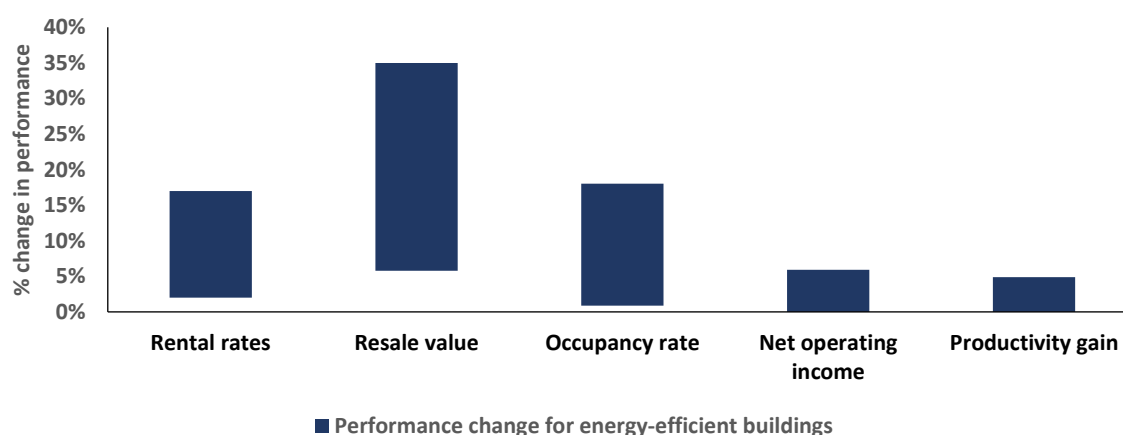
- The contract structure allows for a high degree of transparency on what is being refinanced. Mortgage-backed securities for example provide relatively detailed information at zip code / post code level on the underlying mortgages. Similar detail is available for automobile loans for example. With new data techniques like document scrapping, information on each individual building or car behind each mortgage can be collected for each instrument. The challenge here is that while the information on the mortgage may be available, related information on the climate impact may be missing. One potential area of further exploration is using post code / zip code information to assess the public transport access and related emissions profile of homeowners, as well as using new big data platforms like Geophy to match buildings with their GHG emissions data.
- The use of proceeds are known for this asset class, given that here the asset is linked. As will be discussed later, this provides a key upside relative to corporate bonds and sovereign bonds

Climate assessments for ABS are still limited, but have significant future potential.

The Climate Bonds Initiative has just issued its guidance on real estate green bonds (CBI 2018). While this guidance focuses on green bonds, it can also be adapted to analysing financial instruments more generally. For example, for automobile ABS issuance, an analysis of underlying instruments using e.g. the breakdown of electric / hybrid vehicles or fuel efficiency metrics can be explored.

Of course, these types of assessments may also over time become relevant from a risk perspective, in line with a growing body of evidence around the 'out-performance' of energy-efficient buildings (see Figure below).

Figure 12 The financial out-performance of energy efficient buildings in the United States across indicators (EEBI)



c. *Corporate bonds (financial and non-financial)*

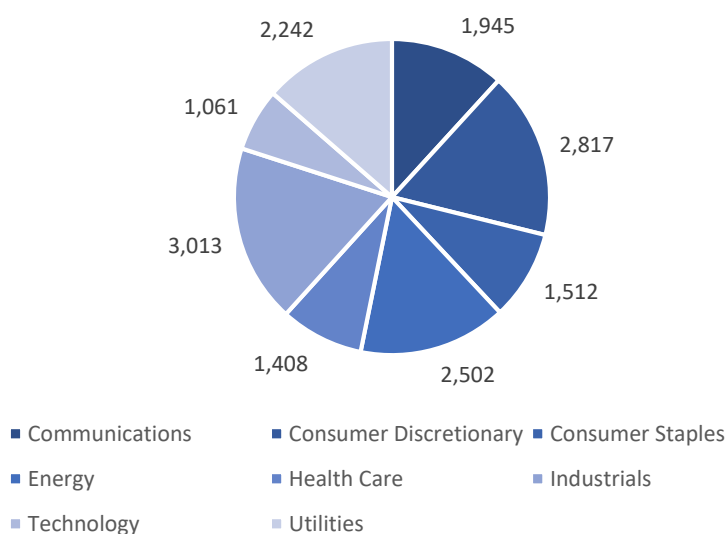
The corporate bonds universe is arguably the one most directly linked to its equity counterpart, but also one not always clearly defined.

Corporate bonds are the universe of bonds issued by financial and non-financial companies that are linked to their balance sheet (thus not asset-backed securities or project bonds). Within this universe, a distinction is frequently made between financial institutions as issuers and non-financial institutions, given the prevalence of the former in overall issuance and the distinction in terms of use of proceeds. For financial institutions, the bond markets are primarily a source of refinancing, whereas corporate bond issues by non-financial institutions serves a much broader array of needs.

In terms of breakdown, nearly half of all corporate bonds are issued by financial institutions.

The Figure below provides a breakdown of the weight of different sectors in the corporate bonds universe (excluding governmental issuers and asset-backed securities, which may also be issued by financial institutions). It reflects the important role of financial institutions, which of course – as outlined above – play a critical role in providing the capital required to finance the transition to a low-carbon economy. At the same time, the breakdown also demonstrates the outsized role of high-carbon sectors in the bonds market, with industrial, utilities, and the energy sector jointly accounting for nearly 25% of corporate bonds.

Figure 13 Breakdown of total bonds issuance 2009-2018 by sector (excluding financials) in \$ billions (Source: Authors, based on Bloomberg)



For financial issuers, the climate impact considerations are largely a function of their loan portfolios, where transparency is limited to date.

Currently only a limited number of financial institutions are conducting climate assessments on their loan books and an even smaller number have started reporting related indicators. Data on Bloomberg (based on publicly available data from loan factsheets) suggests for example that around 1% of loans currently go to 'renewable energy' and 4% to utilities more generally. Relevant to note however that about a third of loans in the data are unidentified. Given the lack of information on banks' corporate loanbooks, this analysis is tricky for investors to execute. Financial supervisors however – notably those in Europe that collect loan level information – may be in a better position to assess the dynamic.

For corporate issuers, the challenge is penetrating the sectoral level.

Similar for equity, sectoral estimates can be used as a proxy for overall exposure to economic activities covered in 2°C scenarios, however they fail to reflect on whether these activities are high-carbon or low-carbon. A more specific analysis is thus needed, penetrating the sectoral level and providing information on both the company and asset level.

The challenge in this regard is that traditionally climate-related information of all issuers of corporate bonds has largely been a black box. Corporate climate reporting has largely focused on listed companies, many if not all of which issue bonds. However, there is a large universe of companies that issue bonds, but are not listed. Moreover, the reporting that does exist – in terms of absolute carbon footprints – faces a number of data challenges, given the lack of integration of Scope 3 GHG emissions and the failure to link this information to economic activity (Hoepner 2016).

Asset-level data can act as one solution to this problem.

Asset-level data – that is data on physical production assets sourced from business intelligence databases and publicly available databases – collected for key high-carbon sectors can help to overcome this challenge.¹⁰ Asset-level data distinguishes itself from corporate reporting insofar as the data point is the actual economic asset (the power plant, the oil field) rather than the company as a whole. They are collected by a range of different data providers across key climate-related sectors using a range of sources (governmental filings, press releases) and techniques (surveys, web-scraping techniques).

This data, given its near global coverage of high-carbon sectors, addresses the concerns of the ‘large cap’ listed bias intrinsic to corporate reporting frameworks. It also directly links to economic activity, allowing for a meaningful link to climate scenarios (Weber et al. 2017). While one solution, it should not be treated as a panacea. Asset-level data addresses one part of the climate challenge, but of course fails to account for issues like R&D, and a large part of efficiency opportunities related to operational GHG emissions.

The next section will apply the asset-level data 2°C scenario approach pioneered by the 2° Investing Initiative in the context of the Sustainable Energy Investing metrics project (financed by the EU H2020 programme) to the corporate bonds universe.

¹⁰ Visit <https://assetleveledata.org/> to learn more.

3. Climate goal alignment and corporate bonds transition risk

a. Climate goal alignment of financial portfolios

The question of portfolio alignment with the 2°C or well-below 2°C goal can be seen from different perspectives.

In the context of listed equity markets, portfolio alignment to date has largely been considered from the perspective of the absolute, relative, or forward-looking exposures to high-carbon and low-carbon technologies and assets.

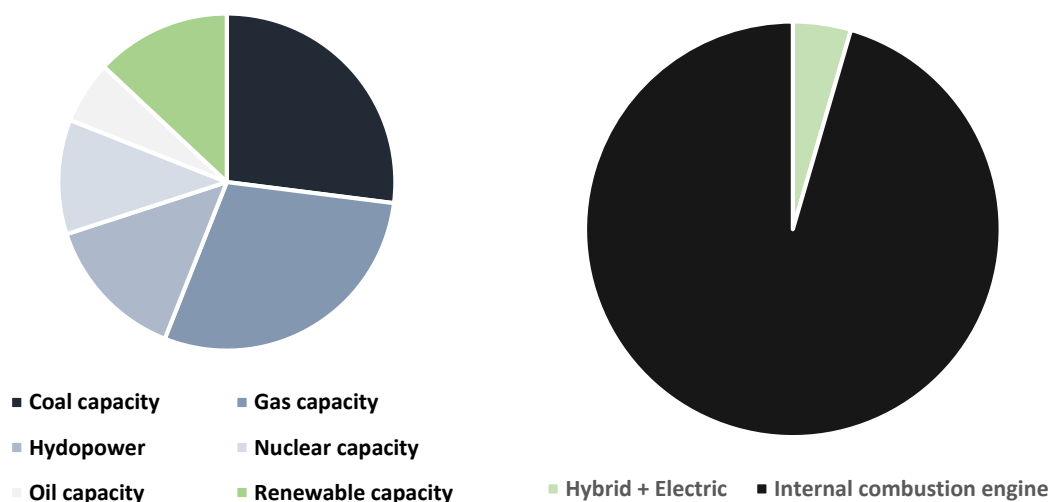
- Absolute exposure for example reflects on the absolute weight of the portfolio or the market vis-à-vis one or the other technology. This intensity can then be taken as the starting point for what the future intensity should look like under a 2°C transition;
- Relative exposure compares the relative weights of different technologies in the portfolio to each other and how that weight in turn is meant to evolve over time. Generally, this approach is only intuitively applicable for technologies within a sector and where there is meaningful low-carbon alternatives (e.g. power, automobile). For fossil fuels for example, the ratio of oil & gas is not necessarily a powerful indicator of 2°C alignment, even if that ratio is set to change over time in the scenarios;
- Forward-looking exposure relates to the rate of change of the weights over time and the extent to which this rate of change (e.g. retirement of coal, build-out of renewables) is consistent with the 2°C transition.

The analysis of corporate bonds provided here uses the portfolio-weight allocation rules recommended by Thomä et al. (2018) for corporate credit, comparing fuel mix intensities.

For the automobile and power sector, high-carbon technologies continue to dominate the market.

In the power sector, over 50% of the installed capacity is coal- or gas-fired power. Renewables in turn only make up around 13% of installed power capacity. For the automobile sector, the low-carbon alternatives still have less than 5% market share. Of course, in some ways, it is not the past, but the future counts, specifically the alignment of the investment with the 2°C transition.

Figure 14: The fuel mix of the power sector and the automobile sector of the global corporate bonds market in 2018
(Source: Authors)



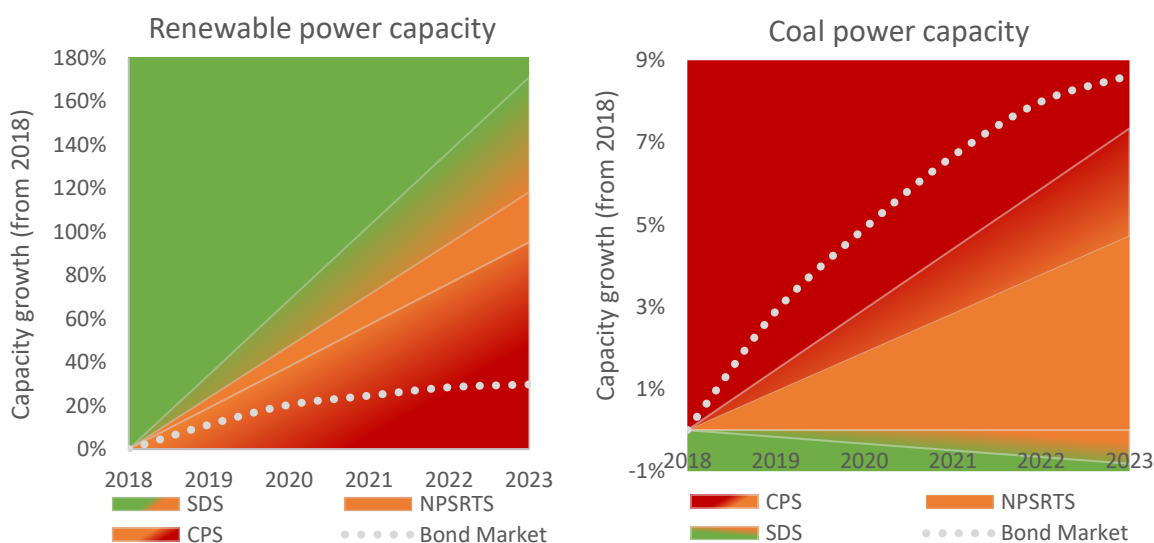
The subsequent discussion will identify the investment trends across the power, automobile, and oil & gas sector, relative to the IEA scenarios.

The analysis is based on a mapping of outstanding corporate bonds and the aggregate investment profile of their issuers, weighted by the size of the outstanding bonds.¹¹ The forward-looking production capacity / production profile is then compared to the IEA scenario range from below 2°C to above 6°C in order to identify the alignment of the market with climate goals. The key modelling assumption here is the proportionate share logic, which allocates the scenario to the global bond market based on the market share in the global economy. Thus, a bond issuer that owns 1% of power assets has to build out 1% of required renewable power capacity additions. A 5 year time horizon reflecting investment horizons was chosen for this model.

In the power sector, corporate investment is not enough to reach the 2°C goal, and is in fact on an above 6°C trajectory.

The figure below is based on asset-level data sourced by GlobalData and shows the trajectory of the renewable power and coal-fired power capacity growth of the current issuers of corporate bonds in aggregate. It shows that corporate bond issuers investment profile is currently significantly misaligned with the IEA Sustainable Development Scenario.¹² This implies that they are both less high-carbon and less low-carbon in terms of the investment profile. The difference is likely driven by the ‘bias’ in bonds markets in favour of developed markets where generally power markets require less investment.

Figure 15 The global bond markets’ capacity growth profile in renewable power and coal power capacity additions relative to IEA scenarios (Source: Authors)



In the automobile sector, bond markets outperform the real economy.

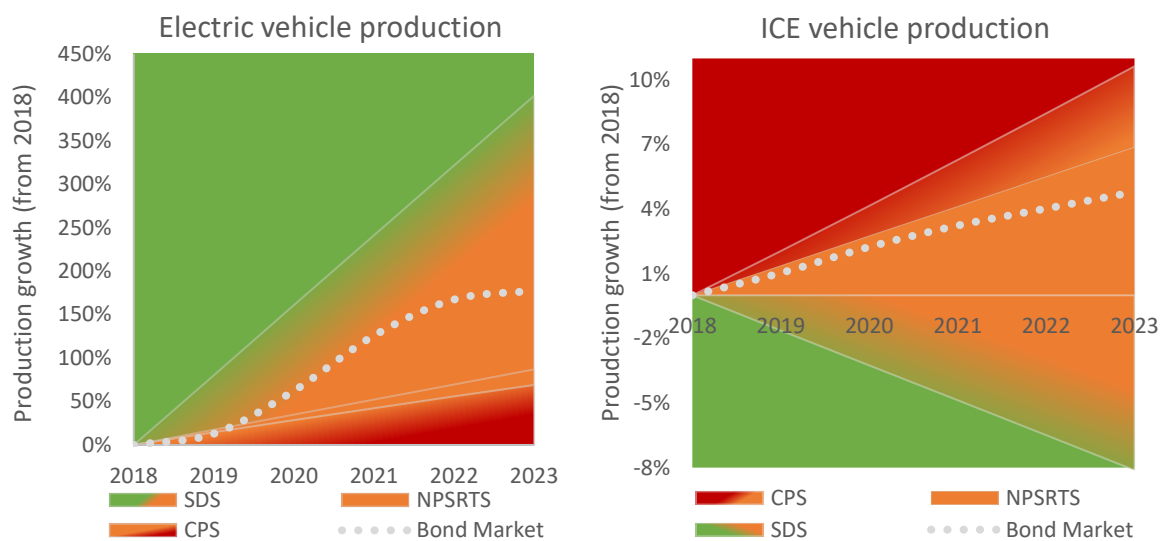
Corporate bond issuers invest more in electric vehicles and less in internal combustion engines than the corporate economy as a whole. At the same time, overall investment levels still lag significantly that which is required to meet the 2°C goal as defined in the 450scenario from the International Energy Agency (a scenario that is only associated with a 50% probability).

¹¹ The analysis here thus relies on the ‘portfolio weight’ approach to allocate economic activity to financial assets. An alternative approach sometimes used is the ‘balance sheet approach’, which however can create biases in the analysis of bond portfolios.

¹² It thus excludes for examples assets owned by households.

Despite this gap, there are two important things to highlight. The market is dramatically shifting. Between May 2016 and January 2018, the estimates for electric vehicle production in 2020 have jumped from around 650,000 to nearly 1.8 million (source). To put this latter number into context, this estimate would have been consistent with the IEA 2°C scenario for electric vehicle production. Secondly, while in relative terms the gap is significant, the absolute shift required for example for electric vehicles is only about 1% of global sales in the short-term, a relatively ‘benign’ shift in the overall automobile car market. Of course, this number increases to 40-50% and more in the medium- to long-term.

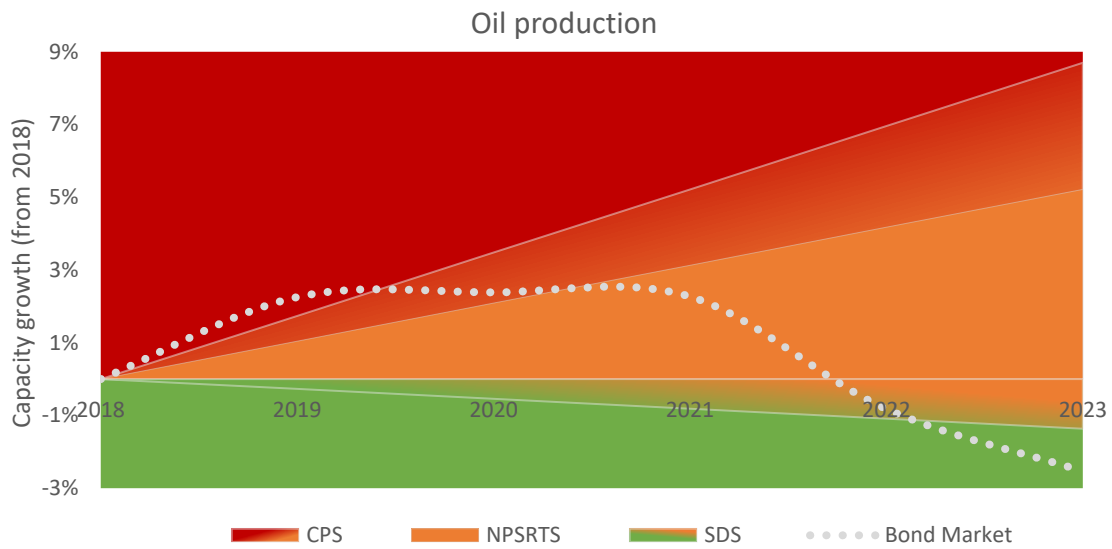
Figure 16 The global bond markets’ capacity growth profile in electric vehicle and internal combustion engine (ICE) production relative to IEA scenarios (Source: Authors)



Fossil fuels show a much more positive picture, suggesting that price signals are being integrated by companies. At the same time, the results are largely driven by investment cycles and thus may still shift rapidly if oil and gas prices creep upwards.

The figures below show the estimated evolution of production capacity for oil production in the global corporate bonds market. The results suggest that while there is some volatility, the trends are approaching the IEA 2°C scenario by 2022. This is largely driven by a shift in capital expenditure strategy by oil and gas companies following the shift in prices. A similar analysis conducted in 2015 would have shown explosive growth following the investment boom of the early 2010s. By extension, the figure may still change moving forward in response to changes in relative prices – which in turn will also have impact on climate goals. Of course, these results are a function of the relatively limited ambition of the 2D scenario for oil relative to other scenarios, notably those by Greenpeace.

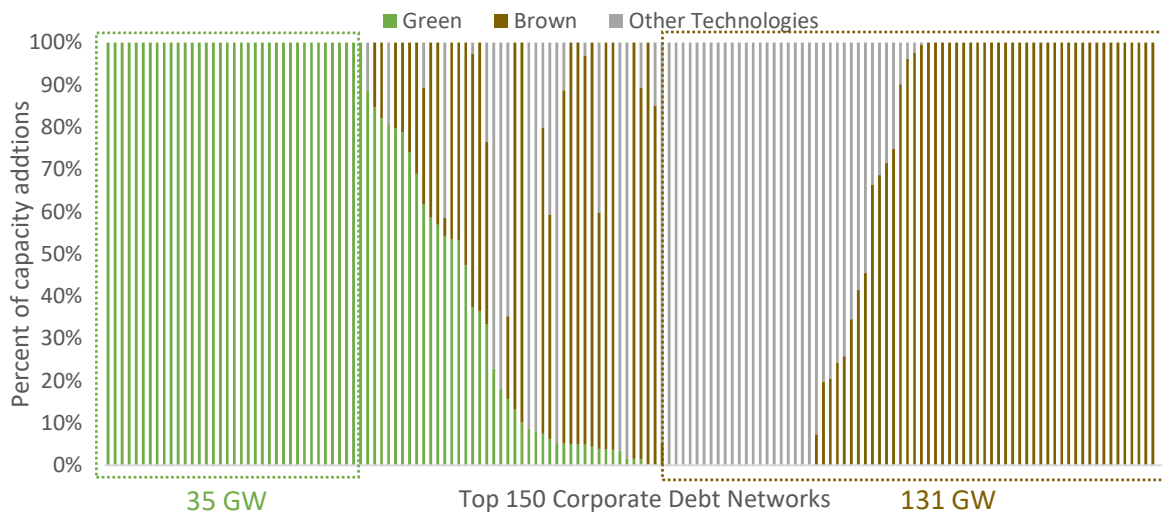
Fig. 17: The global bond markets' capacity growth profile in oil production relative to IEA scenarios (Source: Authors)



Crucially, the aggregate results presented here hide the universe of choices that institutional investors can make in their corporate bonds portfolios.

Corporate bond funds exhibit significant variations in their exposure both to transition sectors as well as the underlying high-carbon and low-carbon technologies deployed in these sectors. In terms of corporate bonds issuers, predictably, there is also a wide divergence in strategy. Interestingly, this divergence appears to be polarized. In a sample of 150 corporate bond issuers with at least 1 GW of installed capacity, around 50% of issuers either invest 0% in renewable power (with respect to their total power investment) or 100% in renewable power – with the other half in between these two poles. The results suggest both at mandate design level, and in the allocation of capital to different issuers in the context of daily portfolio management, significant lee-way.

Figure 18 Breakdown of type of capacity additions of the top 150 corporate debt networks (issuers) by technology in the power sector (Green = renewables; Brown = coal, oil, gas; other technologies = nuclear, hydro) (Source: Authors)

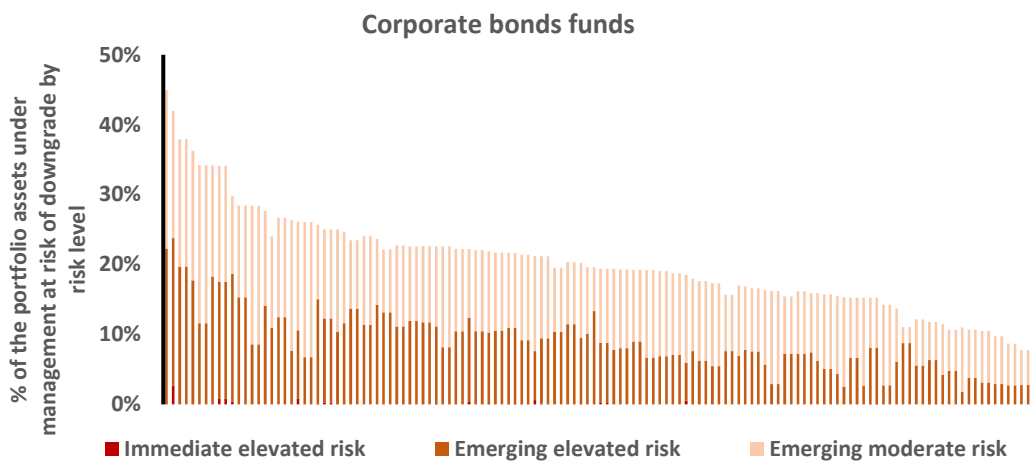


d. Transition risk in corporate bonds markets

Beyond aligning financial markets with climate goals, the transition to a low-carbon economy may also constitute a financial risk.

As outlined above, bonds may be less exposed to these risks in the short-term, given their maturities and position in the capital stack. Nevertheless, exposures to these trends exist. The figure below highlights the share of the corporate bonds portfolios of Swiss pension funds that, according to analysis by Moody's, is exposed to sectors with immediate elevated, emerging elevated, or emerging moderate risk of downgrade. This analysis, it should be noted, extends to a broader suite of environmental risks, not just limited to climate.

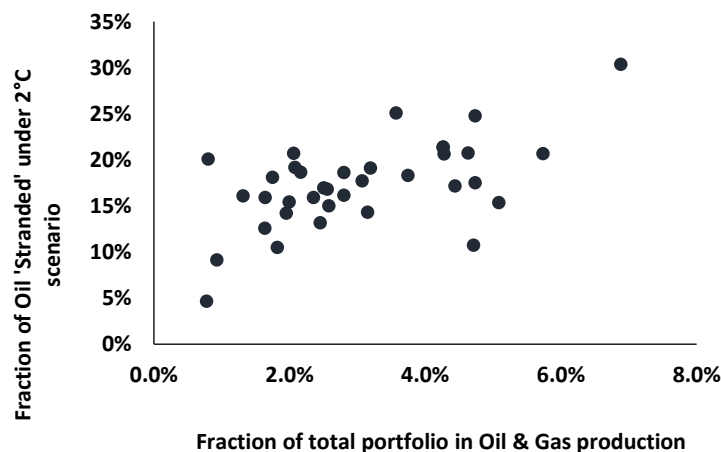
Figure 19 The share of environmental risk sectors in the portfolios of Swiss pension funds



Transition risk assessment is obviously equally relevant at sub-sector / security level.

One approach to transition risk analysis is identifying the exposures to high-cost or stranded 'oil' under a 2°C scenario. The Figure below shows – for 35 US insurance companies – the percent of their portfolio exposed to oil & gas production and the percent of the associated oil production 'stranded' under a 2°C scenario. Again, it highlights the significant distribution of exposures across insurance companies bond holdings.

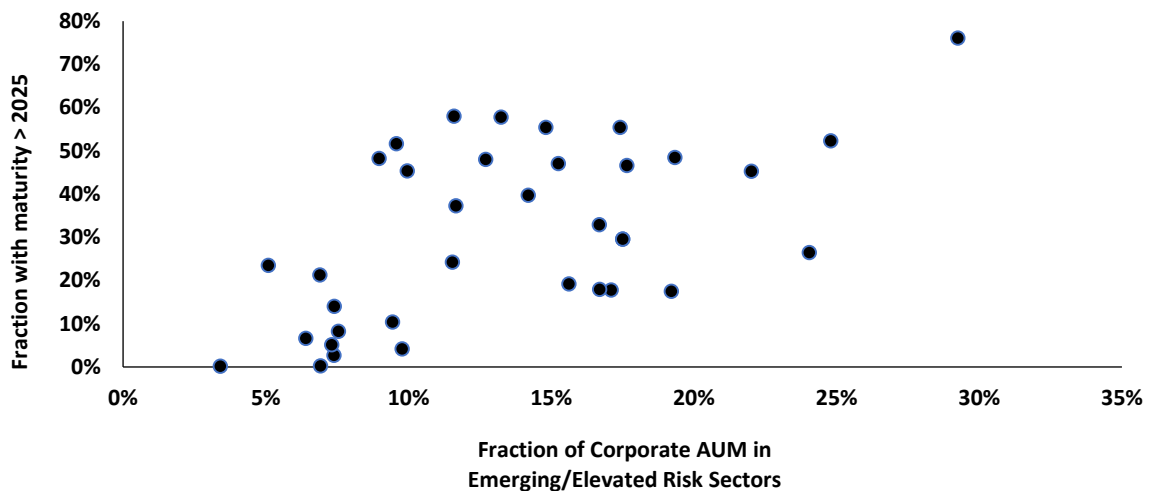
Figure 20 Share of portfolio in oil and gas production and percent 'stranded' under a 2°C scenario of 35 US insurance companies (Source: Authors)



As highlighted above, the question of time horizon is key.

In the short-term, exposure to environmental risks and transition risks will be less material for instruments with short-term maturities. The figure below highlights the exposure for 35 US insurance companies. The figure shows that while some insurance companies have significant exposures, they may mature in the short-term and thus be less exposed to long-term transition risk trends whereas portfolios with lower exposures, but long-term maturities may be more exposed.

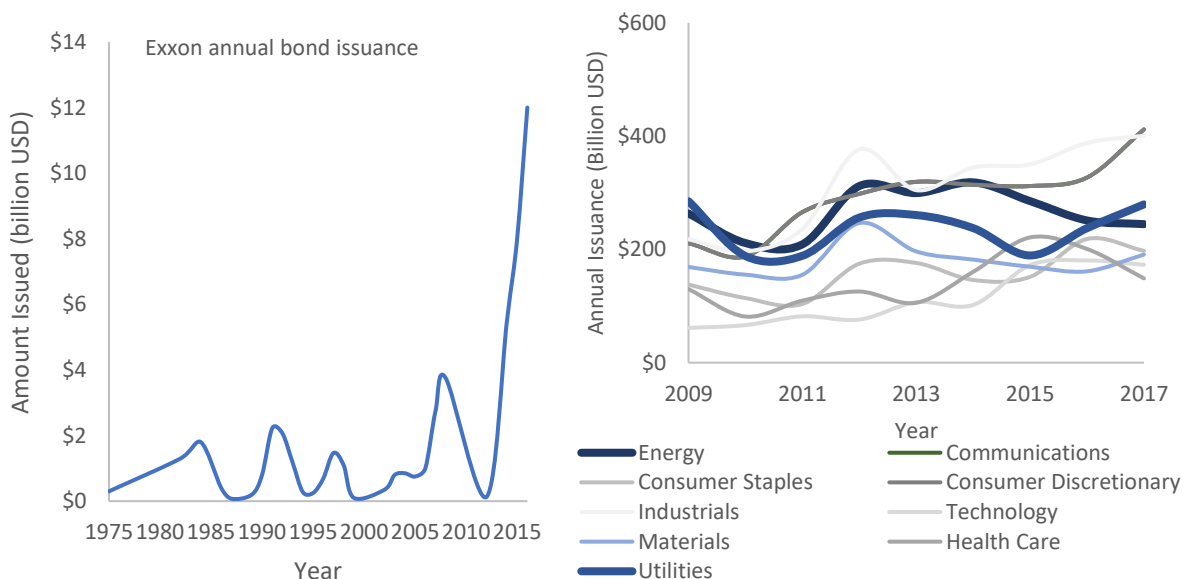
Figure 21 The share of US insurance companies (n=35) exposed to emerging / elevated risk sectors and the percent of maturities in these sectors beyond 2025.



Transition risks will also evolve over time.

Transition risks may increase or decrease as a function of issuance. Tracking this over time may be a key tool to monitor the health of the industry. Bond issuance for the utility sector for example has increased significantly since 2015. This could be a function of higher investment levels (perhaps in the direction of renewables) or offsetting lower revenues. While the energy bond issuance annually has staid flat in turn, for individual companies like ExxonMobil, a significant spike can be seen in the past years.

Figure 22 Annual bond issuance by sector (left-hand side) and Exxon annual bond issuance (right-hand side) (Source: Authors, based on Bloomberg)



4. Challenges

Three key challenges exist in graduating our understanding of bond markets.

Use of proceeds information. As outlined above, the concept of use of proceeds is largely missing in the sovereign bonds space and limited to refinancing in the case of asset-backed securities (with uncertainties as to what the refinancing proceeds will be invested in in the future). For corporate bonds, the issue with use of proceeds is two-fold. First, technically use of proceed bonds have knock-on effects on the ‘general purpose bonds’. For example, if a utility issues a bond to finance renewable power investment, technically the associated investment should be excluded from the assessment of the other bonds that the utility issues. This is obviously difficult to track however. Secondly, as outlined above, use of proceed claims are somewhat artificial since corporate bonds in the over-whelming majority of cases are still balance-sheet financing.

‘Missing sectors’. Asset-level data helps expand the universe of assessable assets from green bonds (<0.5% of the market, according to the Climate Bonds Initiative) to somewhere closer to 5-10% of the market, based on an analysis of the Bloomberg universe and the portfolios for Swiss pension funds and insurance companies. At the same time, the scope of assessment focuses on the asset activities only and don’t extend to issues like R&D and energy efficiency. It also currently doesn’t extend to other climate-relevant sectors like agriculture and forestry, chemicals, and glass.

Allocating economic activity to financial assets. The question of how to allocate economic activity to financial assets bedevils analysis in both equity and credit portfolios. In equity portfolios, one neat solution is the allocation of ownership based on ownership shares. For corporate bonds portfolios, where the concept of ownership share does not exist intuitively and may be subject to price biases, this strategy is not directly applicable. For example, allocating economic activity over all outstanding debt in the case of oil & gas companies would penalize those debt holders of companies with relatively low levels of debt, even though such exposure may theoretically be less risky, given lower leverage. On the other hand, using a broader metric like enterprise value introduces price biases again.

An alternative approach – applied for example in fund ratings¹³ – uses the portfolio weight of instruments to allocate economic activity. This approach, while not speaking to absolute exposures, can help allocate relative exposures. As an example, Erlandsson (2017) introduced the ECOBAR model for scoring carbon exposures across complex credit portfolios using a relative portfolio-weight approach.¹⁴

Figure 23 Breakdown of CO2 emissions by sector; Blue = Covered by 2°C alignment tools (Source: Authors, based on Bloomberg data)

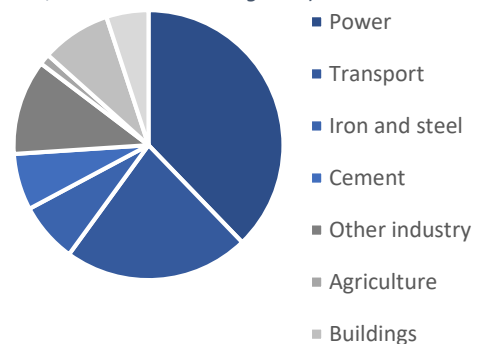
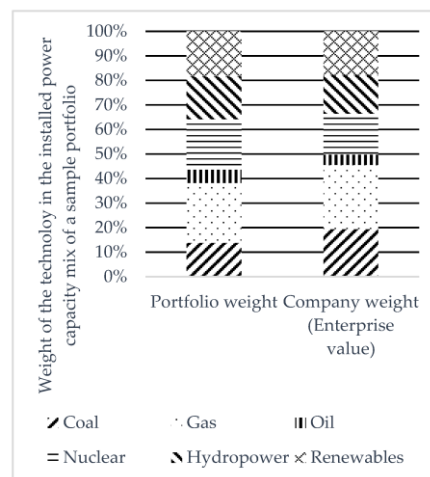


Figure 14 The sensitivity of a portfolio’s fuel mix to different allocation rules (Source: 2°ii 2018)



¹³ See for example MSCI ESG Ratings Methodology, example

¹⁴ Erlandsson, Ulf, Credit Alpha and CO2 Reduction: A Portfolio Manager Perspective (April 19, 2017). Available at SSRN: <https://ssrn.com/abstract=2987772> or <http://dx.doi.org/10.2139/ssrn.2987772>

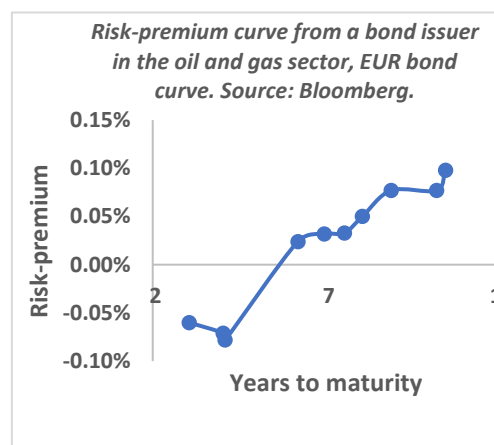
5. Conclusion and potential for action

Investors have a range of tools at their disposal to develop climate strategies for bond markets. These are the same types of tools also available for equity investors:

- **Providing capital / removing capital.** Intuitively, the first type of action available to investors is to provide / remove capital by adjusting their portfolio strategy. This could relate to targets around investing in companies that align their business plan with a 2°C scenario or set a science-based targets. It can also involve implementing a strategy to no longer finance companies that are misaligned with a 2°C scenario. At macro level, this strategy could obviously also extend to a more holistic portfolio view where the net capital exposure is consistent with a 2°C outcome at global level. The key question here is impact. Virtual ringfencing may reduce the extent to which investments are targeted. On the other hand, the authors are not aware of direct evidence in terms of the impact of divestment in bonds market in terms of company business plans. There is evidence that divestment strategies so far have not influenced the pricing of assets (see box below). Equally, advocates of the divestment movement do not see asset pricing as the primary impact channel.

Box: Impact of divestment on spreads

To illustrate the importance of divestment from certain type of issuers if we are to reach the 2 degree target, one has to consider the abundant amount of cheap finance to non-compliant issuers today. In the Figure below, we provide data for the risk-premium for a certain large, AA-rated, bond issuer in the oil industry. For bonds maturing in 10 years, the issuer pays about 0.09% - 9 basis points – per annum. This is just a wafer-thin margin above so called risk-free rates. This suggest that the impact of the divestment movement cannot yet be seen in bond prices, although of course their strategy may relate to the broader objective of stigmatization, rather than the cost and availability of capital in financial markets.



- **Influencing pricing.** A related approach focuses on adjusting the pricing of bonds in terms of investors changing the terms under which they provide capital – either preferential terms or increasing the risk premium. It should be noted that public bond market’s place in the financial system is to provide unconditional financing to issuers. In exchange, investors get much better security and recourse over the issuers’ total assets than equity investors. The improved security together with the lower lack of visibility and direct company influence is constantly being priced in the bond market. It is only in the higher risk segment of the market, the high-yield/junk bond market, that bond contracts tend to impose conditionality such as financial covenants. Attempting to impose too much structure in the bond-contract itself is unlikely to be met with great support from the market place.

Box: Conditional financing in credit

While the concept of conditional financing or price influencing currently has not been applied in bonds markets, first pilots have sprung up with regard to conditional financing in corporate lending portfolios. These pilots have largely focused on sustainability criteria more generally, rather than climate change specifically. One example in this regard is the partnership between ING and Philips on a EUR 1 billion loan with an interest rate that's coupled to the company's sustainability performance and rating. ING is coordinating the facility as part of a syndicate of 16 banks. The sustainability rating is benchmarked by Sustainalytics.

- **Engaging with issuers.** Finally, an emerging conversation in bond markets around climate change issues is the question of engagement. Bond investors are increasingly considering their potential influence on companies independent of their 'equity ownership'. Large bond investors like PIMCO are starting to develop engagement strategies around climate change. While relatively recent, this channel may ultimately be a complement to engagement by equity investors. It can also complement the strategies around influencing pricing and / or withdrawing capital, as suggested by Hoepner and Erlandsson

“Despite the obvious benefits and increasing investor commitment to engagement among equity investors, ESG engagement remains less common among fixed income investors ...”

Kris Douma, Director of Investment Practice & Engagemen

Box: Case studies on bond engagement on ESG

A recent publication from PRI and their bondholder engagement working group states finds that “a growing number of PRI signatories engage in relation to at least some of their total fixed income holdings, with 66% of those investing directly in fixed income markets engaging with at least one type of issuer. A much smaller number of signatories engage systematically across a large proportion of their fixed income portfolios. Among European investors, for example, 23% engage on more than one quarter of their non-financial corporate bond holdings.” Some examples of bondholder engagement presented in the PRI report include:

- Determining materiality before buying corporate and municipal bonds based on external standards such as those provided by SASB, coupled with its internal sector-level and issuer-level materiality assessment (Breckinridge Capital Advisors, Investment Manager, US)
- Prioritization of engagement with utilities based on understanding firms' planning around two degree policies; and assessment of stranded asset risk in their planning assumptions; (PIMCO, Investment Manager, US)
- Declining investing in corporate bond after assessment of product carbon footprinting performance, management of labour disputes, and poor governance profile (QIC, Investment Manager, Australia)

¹⁵ “ESG engagement for fixed income investors”, PRI (2018)

Additional options for action to be considered by other stakeholders

Based on the structure and dynamics of the bond market, there are additional options that can be explored to support the alignment of bond markets with climate goals beyond the actions of institutional investors. For example, given the dependency on benchmarks in the fixed income market, a revaluation of the benchmark integrated in portfolio mandates could be explored. A related approach would be to use credit rating to set a bottom line for investable assets, based on the alignment of companies and projects with 2C scenarios, i.e. introducing a climate-related investment grade for bonds. The benchmarks as well as the rating approach can be driven by demand from asset owners and managers who currently lack instruments to operationalize Paris commitments in their bond portfolios.

The rationale behind the rating approach is to increase the cost of capital for non-aligned projects and companies. Some investors may also choose to contribute to the price correction by applying a hedging strategy, thereby leveraging a key feature of bonds: risk adjusted pricing. This approach can be highly effective for a focused mandate, while less applicable to the bond market in general. However, such 'betting' against carbon intensive assets could send important signals to market participants and contribute to adjusted market pricing, too, if only indirectly.

Finally, in addition to investors and rating agencies, financial regulators and supervisors can consider monitoring climate-related risks and how they are managed for the bond market, too, in order to maintain financial stability and an efficient allocation of capital. One example for this initiative is the California Insurance Commissioner's work on corporate bonds scenario analysis for insurance companies operating in California.

The key challenge is the lack of evidence regarding impact on which climate strategies work and which ones don't.

While a groundswell of announcements around engagement, divestment, green bonds, etc. has captured financial markets in the past years, scientific evidence as to the relative impact of each of these trends is lacking. Most of the analysis to date identifies 'soft' effects, like increased disclosure, awareness raising and cultural shifts – elements which do not speak directly to questions of GHG emissions reduction. Similarly, advocates of different strategies suggest that signalling effects – in the case of divestment – and the development of national infrastructure plans – in the case of green bonds – are the real desired 'impacts', as opposed to a narrow view of the actual business plan of a company.

While this may be the case, it is still at the end of the day investment decisions by households, governments, and companies, all represented in bond markets, that will enable the ultimate climate outcome. And it will be to a significant degree bonds markets that will be expected to deliver the capital to realize these outcomes, ideally in a way that is consistent with global climate goals. Delivering this outcome then is the challenge that bond markets face, across the entire bond portfolio, if they are to manage the elephant in the room that this market represents.

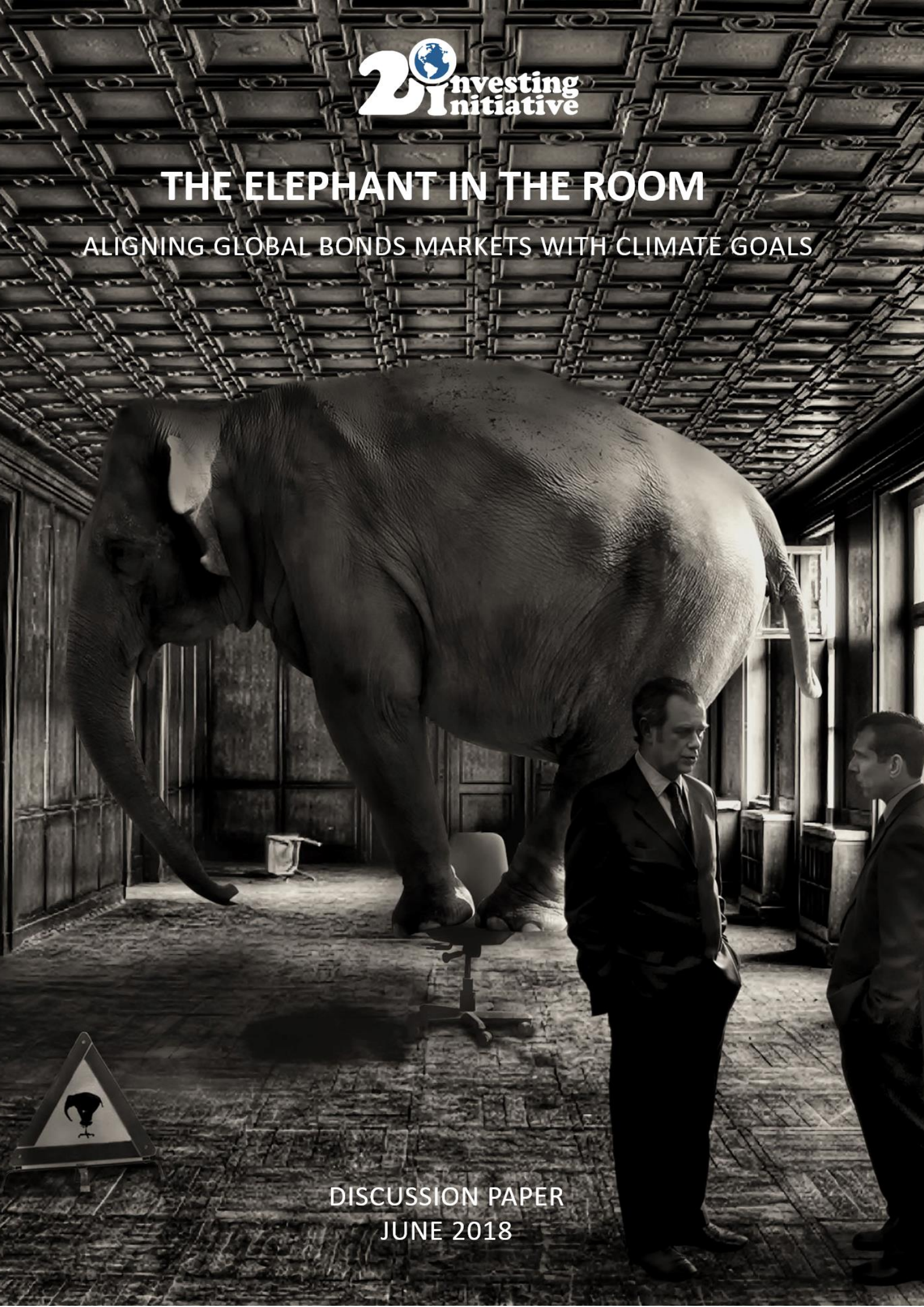
Bibliography

- AXA GROUP (2016) 'Award on Investor Climate-related Disclosures', < https://cdn.axa.com/www-axa-com%2Fcb46e9f7-8b1d-4418-a8a7-a68fba088db8_axa_investor_climate_report.pdf> accessed 19 June 2018.
- BURCK, J.; MARTEN, F.; BALS, C. & HÖHNE, N. (2017) 'Climate Change Performance Index – Results 2018', Germanwatch, NewClimate Institute & Climate Action Network International <<http://germanwatch.org/de/download/20503.pdf>> accessed 19 June 2018.
[Unsicher: Climate policy score Germanwatch NewClimate Institute?]
- BURNS, S.; ALEXEYEV, A.; KELLY, R. & LIN, D. (2016) 'Carbon Disclosure and Climate Risk in Sovereign Bonds', The Global Footprint Network <https://www.footprintnetwork.org/content/documents/2016-Carbon_Sovereign_Bonds.pdf> accessed 19 June 2018.
- CALDECOTT, B.; DERICKS, G.; BOUVERET, G.; SCHUMACHER, K.; PFEIFFER, A.; TULLOCH, D. J.; KRUITWAGEN, L.; MCCARTEN, M. (2018) 'Asset-level data and the Energy Transition: Findings from ET Risk Work Package 2', University of Oxford, Sustainable Finance Programme <<http://www.smithschool.ox.ac.uk/research/sustainable-finance/publications/Asset-level-data-and-the-Energy-Transition-Findings-from-ET-Risk-Work-Package2.pdf>> accessed 19 June 2018.
- EHLERS, T. & PACKER, F. (2017) 'Green bond finance and certification', BIS Quarterly Review, September 2017 <https://www.bis.org/publ/qtrpdf/r_qt1709h.pdf> accessed 19 June 2018.
- ERLANDSSON, U. (2017) 'Credit Alpha and CO2 Reduction: A Portfolio Manager Perspective', SSRN Electronic Journal <<http://dx.doi.org/10.2139/ssrn.2987772>> accessed 19 June 2018.
- HOEPNER, A. & YU, P.S. (2016) 'Science Based Targets Without Science Based Disclosure? Towards a Complete Carbon Data Science.' SSRN Electronic Journal <<http://dx.doi.org/10.2139/ssrn.2715101>>
- INSTITUTE FOR BUILDING EFFICIENCY (2014) 'Assessing the value of green buildings', <<https://buildingefficiencyinitiative.org/resources/fact-sheet-assessing-value-green-buildings>> accessed 19 June 2018.
- INTERNATIONAL ENERGY AGENCY (2017) 'Energy Technology Perspectives'
- JAKOB, M. & THOMÄ, J. (2018) 'It's on you! Bringing climate assessment for household credit into the 21st century', 2° Investing Initiative <https://2degrees-investing.org/wp-content/uploads/2018/03/2ii_Householdfinance_v1.pdf> accessed 19 June 2018.
- MSCI ESG RESEARCH LLC (2017) 'MSCI ESG Fund Metrics – Methodology' <https://www.msci.com/documents/10199/255936/MSCI_ESG_Fund_Metrics_Exec_Summary_Methodology_May2017.pdf/01a4aa33-ebfb-4a53-9c49-04acbd140485> accessed 19 June 2018.
- NAQVI, M.; BURKE, B.; HECTOR, S.; JAMISON, T. & DUPRÉ, S. (2017) 'All Swans are Black in the dark – How the short-term focus of financial analysis does not shed light on long term risks', 2° Investing Initiative <<http://www.transitionmonitor.com/wp-content/uploads/2017/04/All-Swans-Are-Black-in-the-Dark.pdf>> accessed 19 June 2018.

- OECD (2016) 'A quantitative framework for analysing potential bond contributions in a low-carbon transition' <http://unepinquiry.org/wp-content/uploads/2016/10/8_Analysing_Potential_Bond_Contributions_in_a_Low-carbon_Transition.pdf> accessed 19 June 2018.
- THOMÄ, J.; HAYNE, M. & HAGEDORN, K. (2017) 'Out of the fog: Quantifying the alignment of Swiss pension funds and insurances with the Paris Agreement' 2° Investing Initiative <http://degreesilz.cluster023.hosting.ovh.net/wp-content/uploads/2017/12/2ii_Fog_v0.pdf> accessed 19 June 2018.
- STATE STREET GLOBAL ADVISORS (2018) 'State Street Global Aggregate Bond Index Fund', Factsheet <https://www.ssga.com/doc/factsheets/FS3462_English.pdf> accessed 19 June 2018.
- THE PRINCIPLES OF RESPONSIBLE INVESTING (2018) 'ESG Engagement for Fixed Income Investors – Managing risks, enhancing returns' <<https://www.unpri.org/download?ac=4449>> accessed 19 June 2018.
- THOMÄ, J.; DUPRÉ, S. & HAYNE, M. (2018) 'A Taxonomy of Climate Accounting Principles for Financial Portfolios'; Sustainability 2018, 10(2), 328; <<https://doi.org/10.3390/su10020328>>
- WEBER, C.; THOMÄ, J. & DUPRÉ, S. (2017) 'Yellow Brick Road – From climate investment roadmaps to science-based financing roadmaps' 2° Investing Initiative <http://degreesilz.cluster023.hosting.ovh.net/wp-content/uploads/2018/02/science_based_financing_roadmaps.pdf> accessed 19 June 2018.
- WEBER, C.; THOMÄ, J.; DUPRÉ, S.; EMIN, G. & BOCQUET, R. (2016) 'Measuring the alignment of sovereign bond portfolio with climate goals', 2° Investing Initiative <http://seimetrics.org/wp-content/uploads/2017/10/2ii_BR_Sovereignbonds.pdf> accessed 19 June 2018.
- WHILEY, A. (2017) 'Bonds and Climate Change: the state of the market in 2017', Climate Bonds Initiative, commissioned by HSBC <https://www.climatebonds.net/files/reports/cbi-sotm_2017-bondsclimatechange.pdf> accessed 19 June 2018.

THE ELEPHANT IN THE ROOM

ALIGNING GLOBAL BONDS MARKETS WITH CLIMATE GOALS



DISCUSSION PAPER
JUNE 2018

