Breaking the Bond: Primary Markets and Carbon-Intensive Financing

Christian Wilson & Ben Caldecott

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Aligning finance with sustainability is a necessary condition for tackling the environmental and social challenges facing humanity. It is also necessary for financial institutions and the broader financial system to manage the risks and capture the opportunities associated with the transition to global environmental sustainability.

The University of Oxford has world-leading researchers and research capabilities relevant to understanding these challenges and opportunities. The Oxford Sustainable Finance Programme (OxSFP) is the focal point for these activities and is situated in the University's Smith School of Enterprise and the Environment. OxSFP is a multidisciplinary research centre working to be the world's best place for research and teaching on sustainable finance and investment.

OxSFP is based in one of the world's great universities and the oldest university in the English-speaking world. We work with leading practitioners from across the investment chain (including actuaries, asset owners, asset managers, accountants, banks, data providers, investment consultants, lawyers, ratings agencies, stock exchanges), with firms and their management, and with experts from a wide range of related subject areas (including finance, economics, management, geography, data science, anthropology, climate science, law, area studies, psychology) within the University of Oxford and beyond. Since our foundation we have made significant and sustained contributions to the field, including in some of the following areas:

- Developing the concept of "stranded assets", now a core element of the theory and practice of sustainable finance.
- Contributions to the theory and practice of measuring environmental risks and impacts via new forms of geospatial data and analysis, including introducing the idea and importance of "spatial finance" and "asset-level data".
- Shaping the theory and practice of supervision as it relates to sustainability by working with the Bank of England, the central banks' and supervisors' Network for Greening the Financial System (NGFS), and the US Commodity Futures Trading Commission (CFTC), among others.
- Working with policymakers to design and implement policies to support sustainable finance, including through the UK Green Finance Taskforce, UK Green Finance Strategy, and the forthcoming UK Presidency of COP26.
- Nurturing the expansion of a rigorous academic community internationally by conceiving, founding, and co-chairing the Global Research Alliance for Sustainable Finance and Investment (GRASFI), an alliance of 28 global research universities promoting rigorous and impactful academic research on sustainable finance.

The Oxford Sustainable Finance Programme’s founding Director is Dr Ben Caldecott. For more information please visit: https://www.smithschool.ox.ac.uk/research/sustainable-finance

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Breaking the Bond: Primary Markets and Carbon-Intensive Financing

Christian Wilson* & Ben Caldecott*

*Oxford Sustainable Finance Programme, Smith School of Enterprise and the Environment, University of Oxford

Abstract

To align capital flows with the goals of the Paris Agreement, financial institutions must decarbonise primary market transactions, as these continue to provide new capital to the real economy that can create carbon lock-in and the risk of stranded assets. In this paper we define a new metric, Primary Market Carbon Exposure (PMCE), as the proportion of primary market transactions that occur in carbon-intensive sectors. We calculate PMCE for US corporate bond exchange-traded funds (ETFs) and find that these funds systematically partake in carbon-intensive primary market transactions, with a PMCE of 14% from 2015 to 2020, despite tracking indexes that rebalance monthly. High yield ETFs have a higher PMCE than investment grade ETFs and provide more financing to upstream oil & gas. To avoid becoming capital providers of last resort for carbon-intensive sectors, ETF providers need to reduce PMCE in line with Paris Agreement carbon budgets. For policymakers, not only can passive funds contribute to carbon lock-in, but ETFs directly bought by central banks are financing carbon-intensive sectors. We demonstrate this for ETFs bought by the Federal Reserve in 2020.

Keywords: climate finance, passive investing, fossil fuels, divestment, capital flows

1. Introduction

To date, financial institutions with over $70 trillion have pledged net zero portfolios by 2050, including the setting of interim 2030 targets that encompass all emission scopes (UNFCCC, 2021). Promoted by a growing recognition of climate-related risks and the role of finance in mitigating climate change, these commitments can contribute to the delivery of Article 2c of the Paris Agreement, namely for capital flows to be "consistent with a pathway towards low greenhouse gas emissions and climate-resilient development" (United Nations, 2015). Achieving this goal is critical for securing a low-carbon future. The IPCC estimate that limiting rises in global mean temperatures to 1.5°C above pre-industrial levels will require investment in energy systems alone of $2.4trn annually between 2016 and 2025, equivalent to 2.5% of world GDP (IPCC, 2018).

Despite this challenge, when considering the climate alignment of financial portfolios, a significant amount of focus has been placed on stocks of capital rather than flows of capital. Examples of this include portfolio temperature alignment scores (CDP & WWF, 2020) and portfolio carbon accounting (PCAF, 2020). Furthermore, metrics such as carbon intensity (Hunt & Weber, 2019), shadow impact (Ritchie & Dowlatabadi, 2014) and greenhouse gas exposure (Monasterolo, Battiston, Janetos, & Zheng, 2017) do not explicitly account for capital flows. Recent consultations by the Taskforce for Climate-Related Disclosures on forward looking metrics (TCFD, 2020), the Net-Zero Asset Owner Alliance on a target setting protocol[i] (UNEP FI, 2020) and the Institutional Investor Group on Climate Change on net zero investing (IIGCC, 2020) also all appear to focus on total portfolio holdings rather than flows.

These methods provide useful insights, by, for example, tracking exposure to climate risks. Yet Climate Risk Management (CRM) and Alignment with Climate Outcomes (ACO) – or climate "impact" – are not one and the same (Caldecott, 2020). A key transmission mechanism to drive ACO is through capital allocation, which can affect asset prices and the cost of capital faced by companies in the real economy (Caldecott, 2020; Caldecott, Harnett, Clark, & Koskelo, 2021). Building on Brest and Born (2013) and Brest, Gilson, and Wolfson (2018), Kölbel, Heeb, Paetzold, and Busch (2020) define investor impact as "the change that investor activities achieve in company impact", and company impact as "the change that company activities achieve in social and environmental parameters". In this context, changes in the cost of capital can affect the ability of companies to finance operations and expand, both in low and high-carbon sectors, thereby linking investor impact with company impact. This transmission mechanism is the subject of this paper with respect to equity and bonds, which account for approximately 75% of institutional investor asset allocation (Mercer, 2020; Schroders, 2019).

At the portfolio level, capital allocation occurs in both primary and secondary markets. In the former, newly issued securities are purchased, while in the latter, trades occur in pre-existing securities. Through secondary markets, transactions that alter portfolio holdings can improve CRM, by, for example, reducing the exposure of a portfolio to carbon-intensive sectors. However, even though secondary market transactions can affect asset prices, the impact of these changes on the real economy crystallises once companies raise new capital in primary markets[ii]. Therefore, for financial institutions interested in ACO as well as CRM, it is necessary to track and potentially change primary market portfolio flows. A focus on primary markets is especially relevant for policymakers, given the need to track low-carbon capital flows (Advisory Group on Finance for the UK's Climate Change Committee, 2020).

These arguments are often used to critique divestment, with decisions to sell liquid assets in secondary markets achieving little unless accompanied with publicity or used as a tool in effective engagement (Ansar, Caldecott, & Tilbury, 2013; Quigley, Bugden, & Odgers, 2020). However, as divestment reduces the exposure of a portfolio to carbon-intensive sectors, it will also reduce future carbon-intensive financing through primary markets.

To our knowledge, the Climate Policy Initiative's (CPI) proposed methodology for measuring climate alignment is the first applied only to primary markets (Rosane et al., 2020). This methodology assesses the alignment of new investments made over a period of time (Rosane et al., 2020). In other words, the focus is on capital flows rather than stocks. CPI link new investments with asset-level data to calculate the carbon intensity associated with transactions. To calculate alignment, this metric is compared to sectoral decarbonisation pathways that depend on technology and region. CPI provide an example applied to the power sector, using data from the Global Landscape of Climate Finance 2017.

In this paper, we instead track primary market financing in specific portfolios by measuring the proportion of total primary market transactions that occur in carbon-intensive sectors. This is defined as Primary Market Carbon Exposure (PMCE). PMCE allows carbon-intensive financing to be tracked in the context of an overall portfolio, as well as capital allocation to different carbon-intensive sectors. For example, using PMCE, asset owners can track the proportion of financing allocated to oil & gas exploration. However, the limitation of this approach is that it does not distinguish between leaders and laggards within carbon-intensive industries, and it is not forward-looking, as it doesn't account for a company's future CAPEX or transition plans.

Using this method, we draw attention to the importance of primary markets within the context of the low-carbon transition by applying the PMCE to fixed income ETFs. ETFs and other passive investment funds accounted for 30% of fixed income fund AUM in 2020, up from less than 5% in 1995 (Anadu, Kruttli, McCabe, & Osambela, 2020). We show that ETFs in our sample systematically partake in primary market transactions by investing in new issues before they are included in indexes that rebalance monthly. This demonstrates the flexibility of ETFs to deviate from the day-to-day constituents of indexes tracked. Within primary markets, the PMCE shows that these ETFs allocated 13.6% of transaction value to carbon-intensive sectors from 2015 to 2020. Given the rapid growth in passive investing, this dynamic could restrict the ability of financial markets to facilitate the low-carbon transition. At present, a small fraction of passive AUM is invested sustainably – less than 1% in the US (Morningstar, 2020). Therefore, if active investors reduce their carbon-intensive exposures, passive funds could step in as financiers of last resort by continuing to channel capital into carbon-intensive assets. This could limit the efficacy of sustainable finance policies focused on disclosure and the pricing of climate risks and impacts, with passive funds shown to reduce the cost of capital for issuers (Dannhauser, 2017; Dathan & Davydenko, 2018)

To address this, ETF and passive fund providers should use their flexibility to finance only carbon-intensive companies with robust transition plans, while continuing to develop and promote low-carbon passive funds. Policymakers need to support the development of low-carbon indexes and their use by asset owners. In addition, planned disclosure requirements for financial products and institutions can be extended to include metrics that capture primary market investments. Finally, central banks need to consider the climate impact of ETF purchases. As a case study, we show a PMCE of 13% for ETFs bought by the Federal Reserve in 2020.

This paper forms part of the Energy Transition Risk and Cost of Capital Project (ETRC), initiated by the Oxford Sustainable Finance Programme to examine the interplay between the energy transition and the cost of capital. It is structured as follows. First, we summarise the difference between primary markets and secondary markets and their ability to affect the cost and flow of capital. Second, we apply PMCE metric to corporate bond ETFs. Third, we outline the implications of a growing role of passive funds in primary markets, considering the policy implications and avenues for further research.

2. Primary Markets vs Secondary Markets

As shown in Figure 1, primary market transactions occur when securities are newly issued, with capital flowing from the financial system to the real economy. Secondary market transactions occur in securities that already exist, with trades taking place between financial institutions. Therefore, to capture capital flows to the real economy, we focus on primary markets.

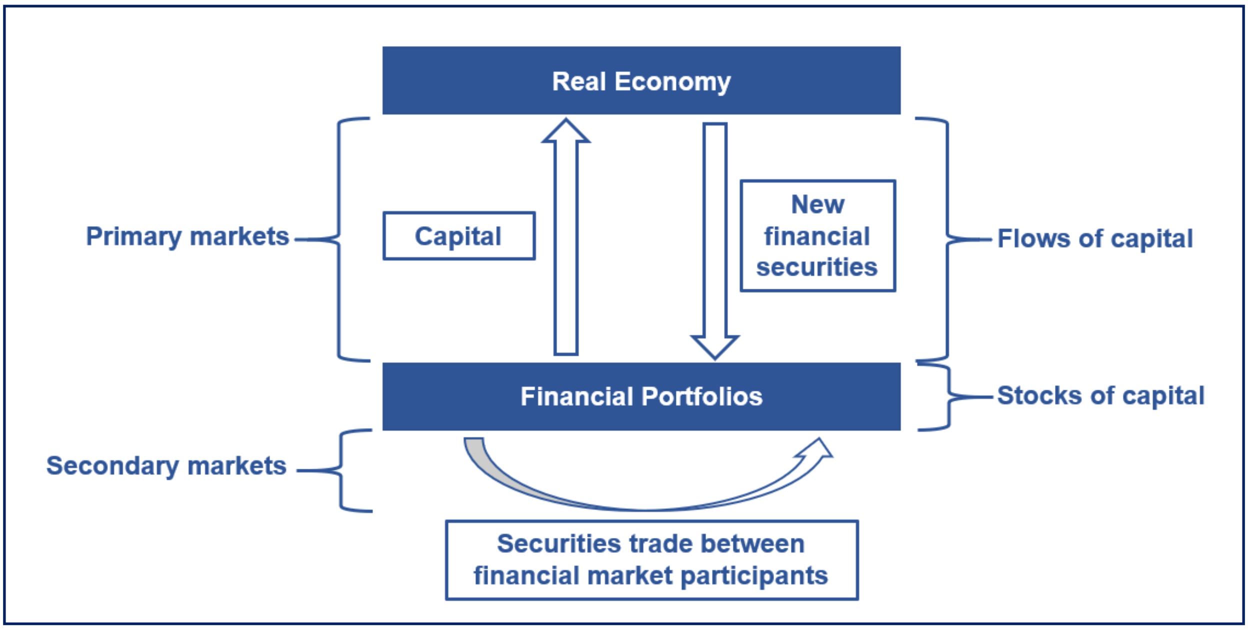


Figure 1. Stocks vs Flows of Capital.

2019	Equity	Corporate Debt
Outstanding Market Value	$54.6trn	$9.6trn
New Issuance	$0.2trn	$1.4trn
% New Issuance	0.7%	14.8%

Table 1. US Capital Market Issuance 2019.
Source. Data from SIFMA (2020).

Depending on the asset class, the importance of primary markets varies. As shown in Table 1, US corporate bond issuance totalled $1.4 trillion in 2019 compared to equity issuance of $0.2 trillion, despite a market value approximately 82% smaller (SIFMA, 2020). From an asset-owner perspective, corporate debt is therefore crucial for the climate alignment of portfolio flows, with bonds accounting for a significant share of carbon-intensive financing in recent years (Figure 2). This has led academics to discuss “denying debt” to companies that are not Paris-aligned while continuing to engage robustly via equity holdings (Hoepner & Schneider, 2020; Quigley, 2019). Hoepner and Schneider (2020) show that in 2021, €226 billion of carbon-intensive bonds will mature that may need refinancing, providing an opportunity for investors to demand improvements in climate performance or withhold capital.

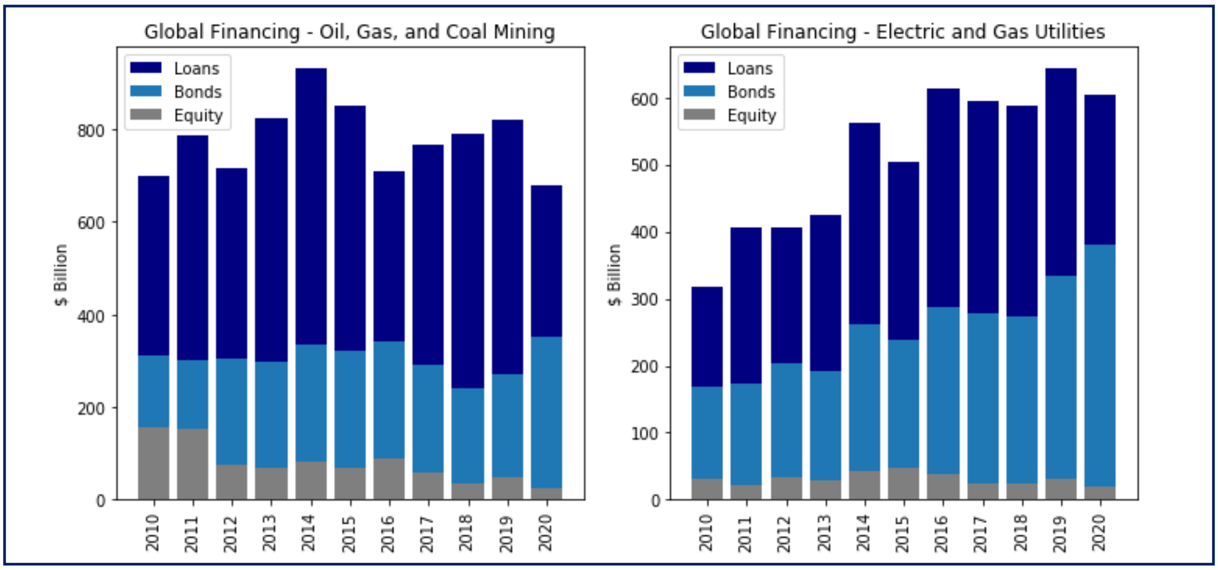


Figure 2. Global Carbon-Intensive Financing
Note. Transaction data is taken from Eikon in USD. Relevant transactions are identified using The Refinitiv Business Classifications (TRBC). Using the definition used by the Task Force on Climate-related Financial Disclosures (TCFD), carbon-intensive assets are classified as those in the energy and utilities sectors, excluding water and renewables.

2.1 Asset Pricing and Sustainability

In market equilibrium models, prices are set through the return expectations of investors, with all available information fully reflected in efficient markets (Gonedes, 1975). In Merton (1987), rather than assume the dissemination of public information is simultaneous, a model is developed with incomplete information, whereby investor knowledge of securities differs. In this instance, an expansion in the investor base reduces the cost of capital, as more investors become knowledgeable and therefore invest.

Developing this approach, Heinkel, Kraus, and Zechner (2001) swap heterogeneous information sets for heterogenous investor preferences, showing that the application of a sustainability screen lowers demand for affected securities and increases the cost of capital as the remaining investors take on more risk. Similarly, Gollier and Pouget (2014) and Luo and Balvers (2017) outline how changes in asset allocation to reflect social responsibility alter equilibrium prices and the cost of capital.

Equilibrium models incorporating sustainability can be also applied to primary markets. When issuing securities, investment banks adjust the cost of capital according to investor demand, aiming to find buyers while minimising costs for the issuing company (Lindvall, 1977). A change in investor preferences that underweights unsustainable companies can change these supply and demand dynamics, increasing the cost of capital (Beltratti, 2005).

2.2 Capital Allocation and Impact

In line with the demand dynamics outlined, Kölbel et al. (2020) identify capital allocation as a mechanism for investors to generate environmental impact, alongside shareholder engagement and indirect impacts. In this section, we review how capital allocation affects asset prices and the cost of capital in both primary and secondary markets.

In equity secondary markets, changes in capital allocation due to index construction positively affect the prices of index constituents due to higher demand from investors (Chang, Hong, & Liskovich, 2015; Morch & Yang, 2001). Similarly, in fixed income secondary markets, Ottonello (2018) show that an increase in index weights increase corporate bond prices.

In primary equity markets, high investor demand decreases the under-pricing of IPOs (Derrien, 2005) and follow-on offerings (Intintoli, Jategaonkar, & Kahle, 2014), while in fixed income primary markets, higher demand reduces the cost of capital at issuance (Bessembinder, Jacobsen, Maxwell, & Venkataraman, 2020; Dathan & Davydenko, 2018). It is primary markets that determine the cost to companies when raising new capital to finance investment and operations, with research showing that a reduction in the cost of capital stimulates corporate investment (Drobetz, El Ghoul, Guedhami, & Janzen, 2018; Frank & Shen, 2016; Gilchrist & Zakrajsek, 2007; Gilchrist & Zakrajšek, 2012; Lin, Wang, Wang, & Yang, 2018). Therefore, in the context of the low-carbon transition, changes in the cost of capital can facilitate low-carbon investment (Curtin et al., 2019; Ondraczek, Komendantova, & Patt, 2015; Schmidt, 2014) or restrict high-carbon investment (Caldecott, 2019; Erickson, Down, Lazarus, & Koplow, 2017; Fattouh, Rahmatallah, & West, 2019).

However, primary and secondary markets do not operate in isolation. Ex-ante expectations of secondary market liquidity (a function of investor demand, as well as other factors) reduces the cost of capital in primary markets (Goldstein, Hotchkiss, & Pedersen, 2019). Furthermore, secondary markets are used as a benchmark for price formation in primary markets, with new issues often priced at a discount to seasoned offerings (Fridson & Gao, 1996; Mola & Loughran, 2004). Therefore, changes in secondary market prices, whether through capital allocation or changes in investor preferences and expectations, can deliver real economy impact, but once primary markets are accessed, with a change in the cost of capital most material for companies in need of external finance (Baker, Stein, & Wurgler, 2003). Primary markets can therefore be thought of as the point of maximum leverage for delivering ACO.

Historically, Scholtens (2006) outlines how sustainable finance has overlooked primary markets, instead focusing on shareholders as a mechanism for impact. Indeed, Urban and Wójcik (2019) note that instead of going to the root of the issue, sustainable finance has conducted a “taxonomic exercise that aims at labelling old finance” with respect to environmental factors. To make finance truly sustainable, these factors must be embedded in primary markets.

2.3 Portfolio Climate Alignment

If the profile of primary market transactions reflects the underlying portfolio, then reductions in carbon exposure, for example through divestment (Hunt & Weber, 2019), will reduce the carbon exposure of portfolio flows going forward. This is underscored by Cojoianu, Ascui, Clark, Hoepner, and Wójcik (2020), who show that divestment commitments reduce carbon-intensive capital flows. Furthermore, a “DivestInvest” strategy can be deployed, whereby capital freed up through divestment is channelled into low-carbon assets (DivestInvest, 2018).

However, certain investors may be unable to immediately alter portfolio holdings. For example, a passive fund with a mandate to minimise tracking error relative to an index, or a buy and hold strategy. Yet, in these instances, improvements in the alignment of portfolio flows can still be achieved by strategically selecting which primary market transactions to partake in. Although this strategy may lead to cause investors to lose out on new issue premiums in carbon-intensive sectors, De Jong and Nguyen (2016) show that a 50% reduction in the carbon-intensity of a global corporate bond portfolio can be achieved without affecting tracking error.

In summary, full divestment from carbon-intensive sectors is not a prerequisite for improvements in the climate alignment of primary markets transactions. Even passive funds can alter their capital allocation in primary markets. As previously detailed, changes in demand in primary markets can alter the cost of capital faced by companies, a key mechanism for causing impact in the real economy. This underscores the need to track primary market transactions, both from the perspective of investors and policymakers, as it is capital raised through primary markets that will finance the low-carbon transition.

3. Methodology

3.1 Primary Market Carbon Exposure

To track portfolio flows, we use a metric called **Primary Market Carbon Exposure (PMCE).** This metric is a time-bound measure of portfolio flows to the real economy, calculated as the proportion of total primary market transactions for a given financial institution or portfolio that occur in carbon-intensive sectors. Carbon-intensive sectors are defined as those that operate in fossil fuel industries, covering coal mining, oil & gas, and non-renewable electric and gas utilities (TCFD, 2017).

$$PMCE_{\ Period\ T} = \frac{Carbon\ Intensive\ Capital\ Flows_{\ Period\ T}}{Total\ Capital\ Flows_{\ Period\ T}}$$

As previously highlighted, bonds account for a significant share of carbon-intensive financing relative to equity. For investors targeting net zero portfolios in line with the Paris agreement, PMCE should reach zero before 2050, as capital supplied to carbon-intensive companies can be used to finance new projects with long lifespans that result in carbon lock-in (Unruh, 2000). In this context, portfolio flows can act as a leading indicator, mirroring company-level transitions in the real economy. For example, for an energy company to transition, the proportion of CAPEX that is low-carbon needs to be higher than the existing stock of low-carbon assets relative to total assets. Similarly, for a portfolio to transition, PMCE will need to be lower than a portfolio’s current exposure to carbon-intensive assets. We recognise that the reality is more complex, as financing for carbon-intensive companies can support their transition. Therefore, in practice, when selecting primary market investments, investors may need to use forward looking metrics to identify which companies are set to successfully transition and not contribute to carbon lock-in.

To demonstrate PMCE in practice we use fixed-income ETFs. This could be replicated in other asset classes, however we focus on fixed-income ETFs for the following reasons. First, bonds account for a significant share of overall carbon-intensive financing, as shown in Figure 2. Second, unlike mutual funds, ETFs disclose daily holdings allowing for trades to be tracked. Third, in fixed income, passive investing accounted for 30% of fund AUM in 2020, up from less than 5% in 1995 (Anadu et al., 2020). ETFs account for approximately half of passive fund AUM, as well as half of passive fixed-income fund inflows over the past decade (Anadu et al., 2020). Using these ETFs provides an insight into a rapidly growing part of fixed income and its ability to shape primary markets.

3.2 Selecting ETFs

To obtain ETFs holdings, data was obtained from Bloomberg in 40-day windows and then combined into matrixes for 1st January 2015 to 31st December 2020. Due to the limitations of this manual approach, only the largest ETFs were selected, defined as those with over $500 million of AUM in US-issued corporate bonds as of 1st November 2020. ETFs selected must provide broad-based exposure to US investment grade (IG) or high yield (HY) bonds within their corporate bond allocations (excluding ETFs that invest in a single rating, sector, or maturity) and disclose daily holdings. Based on these criteria, 35 ETFs were selected, split into 23 IG and 12 HY ETFs. As of 1st November 2020, the IG ETFs held $114 billion of US corporate bonds and the HY ETFs held $66 billion. Combined, these ETFs account for 3% of fixed-income ETFs in number but 44% of ETF US corporate bond holdings in terms of AUM (Table 2). Certain ETFs hold a combination of government bonds, mortgage-backed securities, municipal bonds, and corporate bonds, however PMCE is only calculated for corporate bond holdings. Certain ETFs in the sample also include debt issued in currencies other than USD. In these instances, values are converted into USD. Vanguard ETFs are not in scope, as daily holdings data are not available on Bloomberg. The selected ETFs are listed in Appendix A.

	All ETFs	ETFs in Scope	Coverage
Number of funds	1613	35	3%
All AUM ($bn)	1413	307	22%
Corporate Bond AUM ($bn)	643	244	38%
US Corporate Bond AUM ($bn)	475	210	44%

Table 2. Scope of ETFs selected.
Source. Data from Bloomberg, November 2020.

Using daily holdings data, an ETF trade is identified when a new bond identifier (ISIN) appears in the portfolio. The trade date is compared to the bond's pricing date in Eikon, with business days between the Days After Issuance (DAI). If DAI is 0, the trade is tagged as a primary market trade. To demonstrate this, using CUSIPs we match 4,821 bonds traded by the ETFs with TRACE transaction data. TRACE Enhanced shows that although secondary market trades occur on DAI 0, primary market trades account for 91% of trade volume and 97% of trade value (Figure 3).

However, within 10 days of issuance, on average 34% of ETF trades occur at DAI 0 and 42% at DAI 1 (Figure 3). This split is significantly different to TRACE, yet the combined proportion of DAI 0 and DAI 1 trades is similar at 80% for TRACE and 76% for ETFs. This is likely to be caused by a reporting delay. The SEC requires ETFs to disclose portfolio holdings on a daily basis (SEC, 2014) with ETFs submitting a portfolio composition file (PCF) at the end of each trading day to the National Securities Clearing Corporation (NSCC) (ICI, 2014). Holdings reported relate to Net Asset Value calculations that occur at 16:00 Eastern time when the New York Stock Exchange closes (ICI, 2014). In our sample, 27% of primary market trades in TRACE occur after the market close and therefore would not be included. Furthermore, new issues are reported differently depending on the ETF provider. The proportion of trades at DAI 0-1 is similar across ETF providers but the distribution varies (Figure 3).

Therefore, DAI 1 trades are counted as primary market trades for this analysis. This assumption was checked with market practitioners that trade ETFs. By using both DAI 0 and DAI 1 trades as primary market trades, TRACE data indicates that primary market trade values will be overestimated by approximately 7%, as secondary market trades occur on both DAI 0 and 1 (Figure 3). However, as the focus of our analysis is the proportion of primary market trades that occur in carbon-intensive relative to other sectors, primary market trade values are not adjusted.

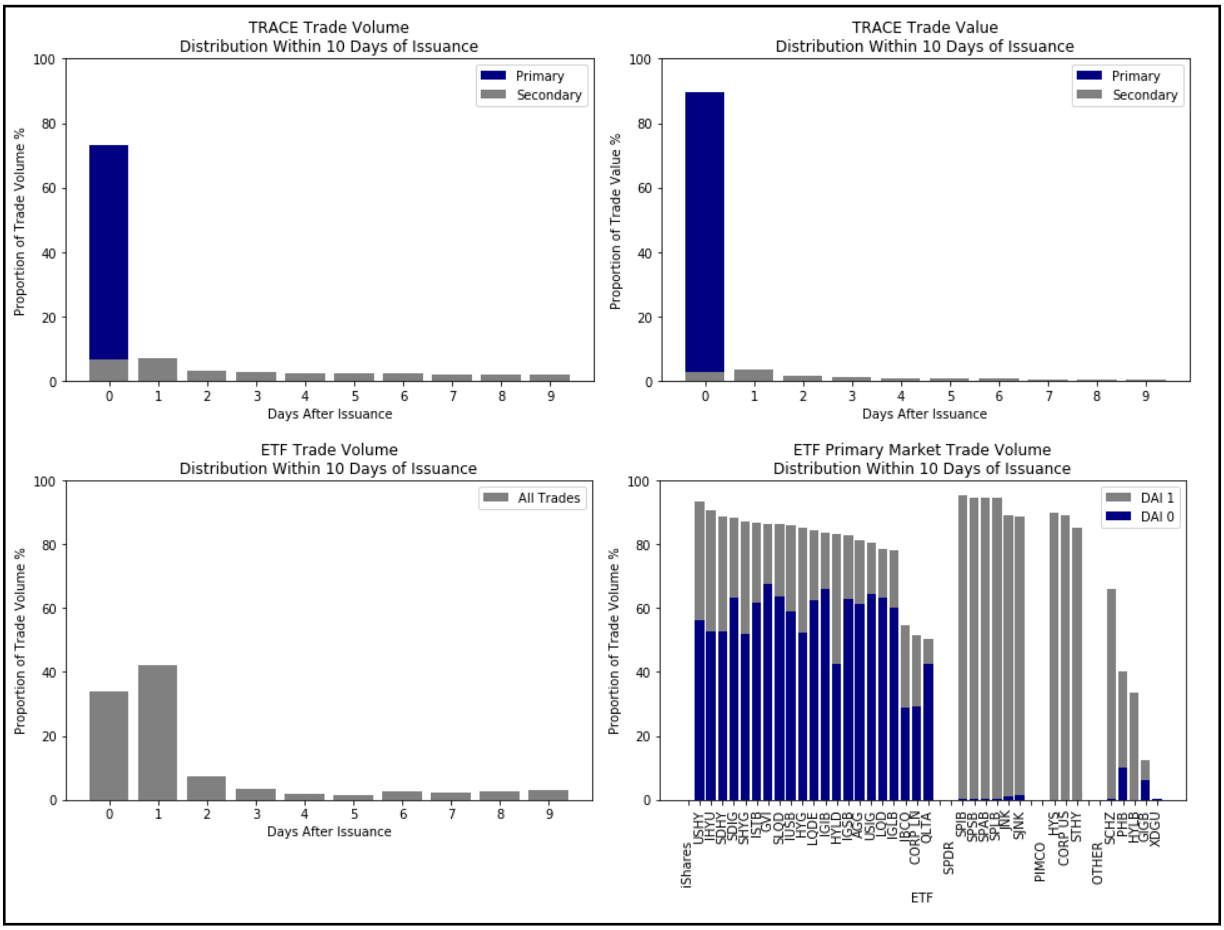


Figure 3. TRACE and ETF Trade Distribution
Source: Data from Bloomberg and TRACE.
Note. In TRACE Enhanced, transactions are tagged as primary market (P1) or secondary market (S1) and whether they occur between dealers (FINRA members) or with non-FINRA members, such as institutional investors. Only sell trades to investors are used.

4. Results

Using this approach, 38,757 primary market trades are extracted across 9,956 bonds. These are used to calculate PMCE on an aggregate basis and for each ETF. Figure 4 shows a combined PMCE of 13.6% for the ETFs over 2015-2020. At the ETF level, PMCE ranged from 6.8% to 29.1%, with an average of 14.5%. Here, only ETFs with over 100 primary market trades are considered (29 out of 35), as ETFs with very few primary markets trades can have an artificially inflated PMCE.

These findings show that ETFs actively partake in primary market transactions despite tracking indexes that rebalance monthly. This trading is likely to occur to capture new issue premiums in primary markets, with issues under-priced to attract investors (Fridson & Gao, 1996). Whether an ETFs focuses on IG or HY bonds is a key factor in determining PMCE. The average PMCE for HY ETFs is 19.8% but 12.4% for IG ETFs. Another key determinant is the underlying carbon exposure of an ETFs corporate bond holdings, with PMCE reflecting the carbon exposure of the underlying portfolio (Figure 4). For asset owners concerned about financing carbon lock-in, this demonstrates the need to consider the interplay between portfolio holdings and portfolio flows.

PMCE scores can be broken down into different carbon-intensive sectors, as shown by Table 3, using TRBC activity classifications (Appendix B). In addition to the ETFs, we calculate PMCE for the entire market, looking at all corporate bonds issued. Relative to global corporate bond issuance, a negligible proportion of ETF financing occurs in coal mining, at 0.04% versus 1.1%. For the ETFs in the sample, upstream oil & gas accounts for 3.80% of financing, mid and downstream oil & gas accounts for 5.32%, and electric and gas utilities account for 4.4%. As well as differences in sector allocation, Table 3 shows that PMCE for ETFs in the sample (13.6%) is higher than the global corporate bond market (10%). However, over 2015-2020 the US accounted for 30.8% of global corporate bond issuance, while in the ETF sample, US issuance was 80.3% of the total. To account for this difference, Table 3 shows PMCE for USD issuance by US issuers only, resulting in a PMCE of 14.7% for the ETFs and 11.5% for all US corporate bond issuance.

To investigate why ETFs still have a higher PMCE than the broader market, Table 3 splits transactions into IG and HY. The sector split for US bond issuance shows that in HY, the proportion of upstream oil & gas financing is higher than IG, at 9.7% and 0.9% respectively. For electric and gas utilities, the HY allocation is lower relative to IG, at 3.3% and 6.6% respectively. For asset owners investing in ETFs, climate risk and the potential for carbon lock therefore differs depending on the type of corporate bond exposure. For IG, financing is focused on utilities and mid to downstream oil & gas, while for HY, financing is focused on upstream oil & gas exploration and production. Table 3 also shows a clear difference between IG and HY for overall PMCE. This is the case for the US corporate bond market and for the ETFs in the sample. For US bond issuance, PMCE is 10.7% for IG and 15.8% for HY. We observe that in the US market, HY issuance accounted for 16.2% of transaction value over 2015-2020, while for the ETFs in our sample, HY issuance accounted for 33.8% of the transaction value. This relative overweight to HY in the sample will drive a higher PMCE relative to the market.

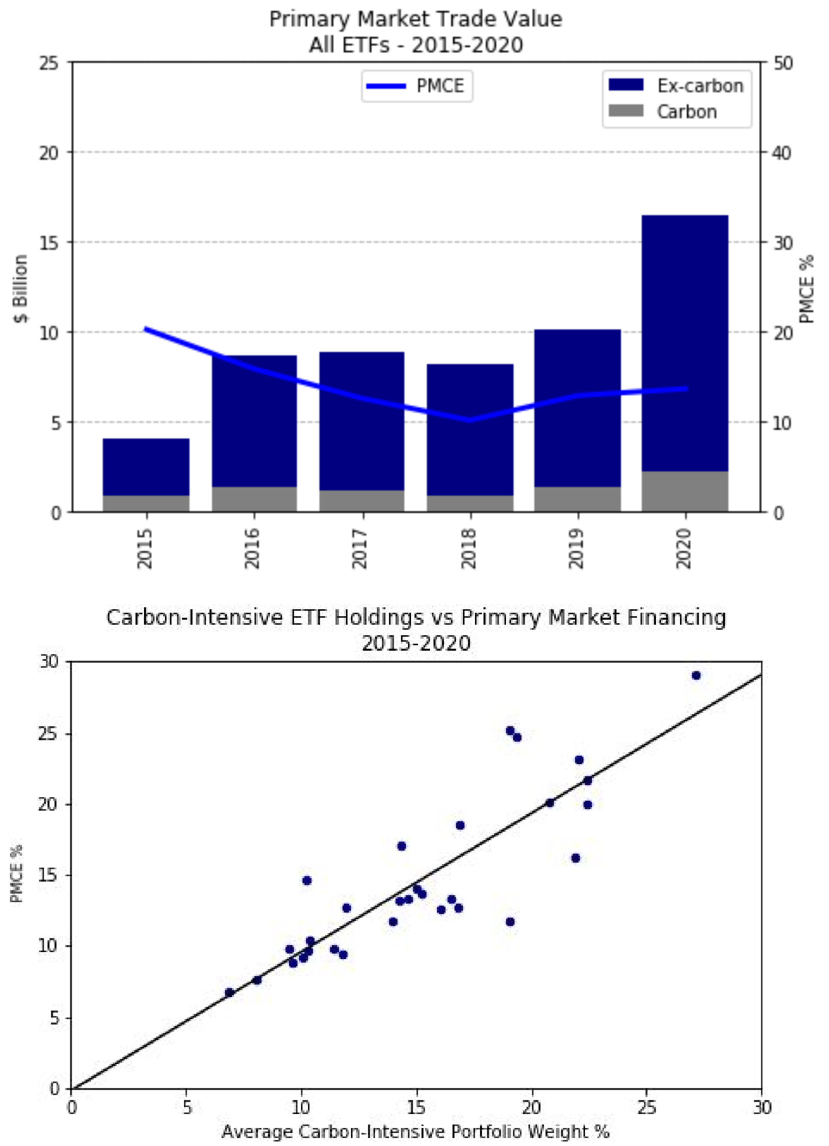


Figure 4. Aggregate and Individual ETF PMCE

Source. Data from Eikon and Bloomberg.

Note. When plotting the yearly average portfolio weight in carbon-intensive assets against PMCE, only ETFs with over 100 identified primary market trades are shown.

	Time Period	Electric and Gas Utilities	O&G Upstream	O&G Mid-Downstream	Coal Mining	Total
Global Corp Bond Issuance	2015-2020	4.77%	1.84%	2.30%	1.06%	9.97%
US Corp Bond Issuance	2015-2020	4.91%	1.96%	4.59%	0.08%	11.54%
IG US Corp Bond Issuance	2015-2020	5.47%	0.99%	4.24%	0.00%	10.70%
HY US Corp Bond Issuance	2015-2020	2.07%	6.94%	6.38%	0.44%	15.83%
Global Corp Bond ETF Trades	2015-2020	4.44%	3.80%	5.32%	0.04%	13.60%
US Corp Bond ETF Trades	2015-2020	5.38%	4.28%	5.00%	0.03%	14.68%
IG US Corp Bond ETF Trades	2015-2020	6.63%	0.88%	3.92%	0.00%	11.43%
HY US Corp Bond ETF Trades	2015-2020	3.26%	9.86%	7.32%	0.08%	20.53%
Federal Reserve ETFs	2015-2020	3.68%	4.06%	5.31%	0.04%	13.10%
Federal Reserve ETFs	2020	3.70%	4.14%	5.18%	0.00%	13.01%

Table 3. PMCE by Sector
Source. Data from Eikon and Bloomberg.
Note. 13 out of 16 ETFs bought by the Federal Reserve in 2020 are captured.

However, Table 3 shows that within IG and HY there is still variation between the ETFs and the broader US market. This is shown in Figure 5, where although the US market and US ETFs have similar PMCE scores for IG, at 10.7% and 11.4%, for HY the variation is larger, at 15.8% and 20.5%. To explore why ETF financing is more carbon-intensive in HY than the market, Figure 5 shows the share of primary market issuance accounted for by the ETFs, comparing carbon-intensive and non-carbon-intensive sectors. In this context, the share of primary market issuance is the combined proportion of a new issue bought by the ETFs. For IG ETFs, the difference between carbon and non-carbon-intensive sectors is negligible at -0.04%, and not statistically significant. For HY ETFs, the difference is +0.41% and statistically significant at the 1% level (see Appendix C). This shows that HY ETFs account for a larger share of carbon-intensive demand in primary markets, increasing PMCE relative to the broader market. As shown in Appendix D, ETF demand within our sample is highest in energy and utilities sectors. Smaller issue sizes in carbon-intensive sectors may play a role. However, as shown in Appendix C, the difference between carbon-intensive and non-carbon-intensive issue size is smaller in HY than IG.

In recent years, certain asset managers and owners have reduced the carbon exposure of their portfolios (Boermans & Galema, 2019; Mésonnier & Nguyen, 2021), while investors with approximately $14.5 trillion in assets have divested from fossil fuels (Fossil Free, 2021) reducing capital flows to carbon-intensive sectors (Cojoianu et al., 2020). As active investors avoid riskier carbon-intensive assets, passive ETFs could be stepping in.

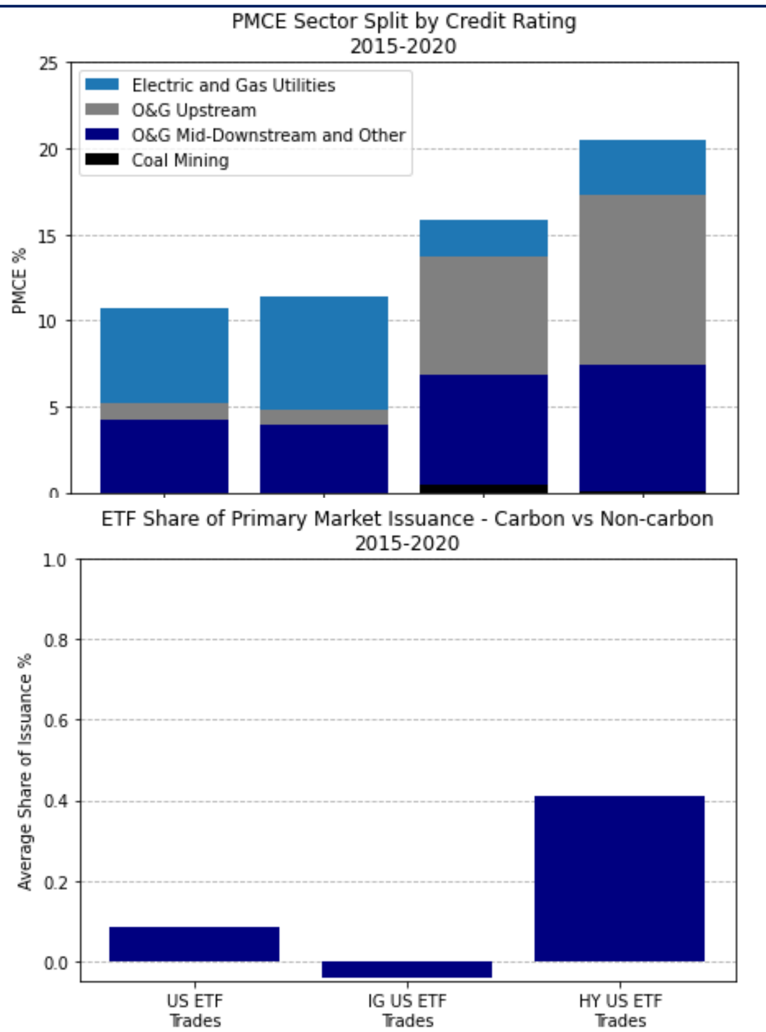


Figure 5. PMCE and Primary Market Demand by Rating.
Source. Data from Eikon and Bloomberg.

5. Discussion: Implications and Further Research

These findings show that ETFs systematically take active decisions to partake in new bond issues before inclusion in indexes at the monthly rebalancing date (Appendix E). From the perspective of an asset owner, this demonstrates the importance of selecting a passive fund that tracks a low-carbon index. However, there are also implications for ETF providers that continue to offer carbon-intensive ETFs.

If these passive funds that track carbon-intensive indexes do not partake in primary market transactions in carbon-intensive sectors, there is the potential that performance would be negatively affected, as new issue premiums would not be captured. However, any performance lost in the short-term needs to be weighed against the long-term economy-wide benefits of avoiding carbon lock-in. Quigley (2019) therefore makes the case that investors should act as a universal owner and apply a decarbonisation mandate to primary market transactions. More broadly, the large share of financing for carbon-intensive sectors from corporate bonds underscores the need for bondholders to actively engage with investee companies and ensure that companies financed are transitioning in line with the Paris Agreement (Hoepner & Schneider, 2020).

Relative to an active investor that can fully divest, passive funds are often required to hold carbon-intensive assets, as they aim to reduce tracking error relative to an index (Aber & Li, 2009). However, there is scope to be selective with regard to the companies financed through primary markets. For example, only financing carbon-intensive companies with robust transition plans. In fact, the largest ETF providers advertise their ability to deploy credit research to identify the best opportunities in primary markets (Vanguard, 2020) – this active security selection could be extended to consider climate factors. Furthermore, as indexes tracked can include up to 10,000 securities, ETFs deploy stratified sampling techniques to replicate index returns (BlackRock, 2021; State Street Global Advisors, 2021). Therefore, in addition to integrating climate factors into primary market investment decisions, there is scope to reflect these factors in ETF holdings alongside the objectives of minimising tracking error and ensuring liquidity. For example, De Jong and Nguyen (2016) show that the carbon-exposure of a corporate bond portfolio can be reduced by over 50% without impacting tracking error. These steps could help prevent passive funds from becoming both “holders of last resort” (Jahnke, 2019) and financiers of last resort for carbon-intensive companies, as other investors step back from carbon-intensive sectors (Mésonnier & Nguyen, 2021).

These findings also have implications for policymakers, such as central banks. In our sample, fixed income ETF AUM grew 200% since 2015 (Figure 6). This rapid expansion is underscored by the jump in primary market financing seen in 2020, with Figure 4 showing a year-on-year increase of 62% overall and a 72% increase for carbon-intensive sectors. This was driven by two factors. First, the Covid-19 induced economic crisis resulted in significant corporate debt issuance (Halling, Yu, & Zechner, 2020), with 2020 issuance reaching record levels and marking a 50% year-on-year increase (SIFMA, 2021). Second, the AUM of ETFs in the sample increased by 36% in 2020, equivalent to $87 billion of inflows. These inflows were prompted by the Federal Reserve's decision to buy corporate bond ETFs for the first time. Although the Bank of Japan has been buying equity ETFs since 2011 as part of its quantitative easing programme (Charoenwong, Morck, & Wiwattanakantang, 2020), the Fed is the first to purchase corporate bond ETFs. In March 2020, the Fed announced an initial allocation of $25 billion in its Secondary Market Corporate Credit Facility (SMCFF) for corporate bonds and US-listed ETFs that provide a broad US corporate bond exposure (Federal Reserve, 2020). At the end of 2020, the Fed had purchased $8.8 billion across 16 ETFs (Federal Reserve, 2021). Although small relative to overall inflows, the announcement improved trading conditions and market confidence (Boyarchenko, Kovner, & Shachar, 2020; Kargar et al., 2020; O'Hara & Zhou, 2020), decreasing the perception of credit risk and supporting issuance (D'Amico, Kurakula, & Lee, 2020).

Out of the 16 ETFs bought by the Fed, 13 are in scope of this paper[iii] (Figure 6). Although not held by the Fed over 2015-2020, the combined PMCE for this period was 13.1%. In 2020, PMCE was 13%, with no financing of coal mining, 4.1% in upstream oil & gas, 5.2% in mid to downstream oil & gas, and 3.7% in electric and gas utilities (Table 3). The Fed has a separate facility for primary markets – the Primary Market Corporate Credit Facility (PMCCF). However, we show that ETFs also partake in primary markets. Therefore, in the context of the low-carbon transition, central banks need to factor in the climate impact of ETFs purchased, in addition to direct corporate bond purchases.

More broadly, the growth of ETFs and passive investing should be a focus of policymakers working at the intersection of climate change and financial markets. To date, policies dealing with climate risks have focused on the provision of climate-related disclosures by companies to market participants (European Commission, 2020; HM Treasury, 2020; TCFD, 2017). Such disclosures are expected to address under-pricing of these risks (Thomä & Chenet, 2017), allowing markets to price them correctly and allocate capital accordingly (Christophers, 2017; Cullen, 2018). However, given the growing market share of passive funds, the efficacy of these policies could be limited, with passive investors buying securities based on index eligibility rather than risk characteristics. This "free-riding" on active investors could reduce the information embedded in prices (Turner, 2018). Furthermore, for US-domiciled passive funds, just 0.6% of AUM is invested in sustainable strategies, while in Europe, this figure is 9.2% (Morningstar, 2020). For those passive funds invested in sustainable strategies, only 9% of assets are in fixed income (Morningstar, 2020). As passive demand can reduce the cost of capital and increase corporate debt issuance (Bessembinder et al., 2020; Dathan & Davydenko, 2018; Ottonello, 2018), further research is required to examine how passive investing affects the pricing of climate risk.

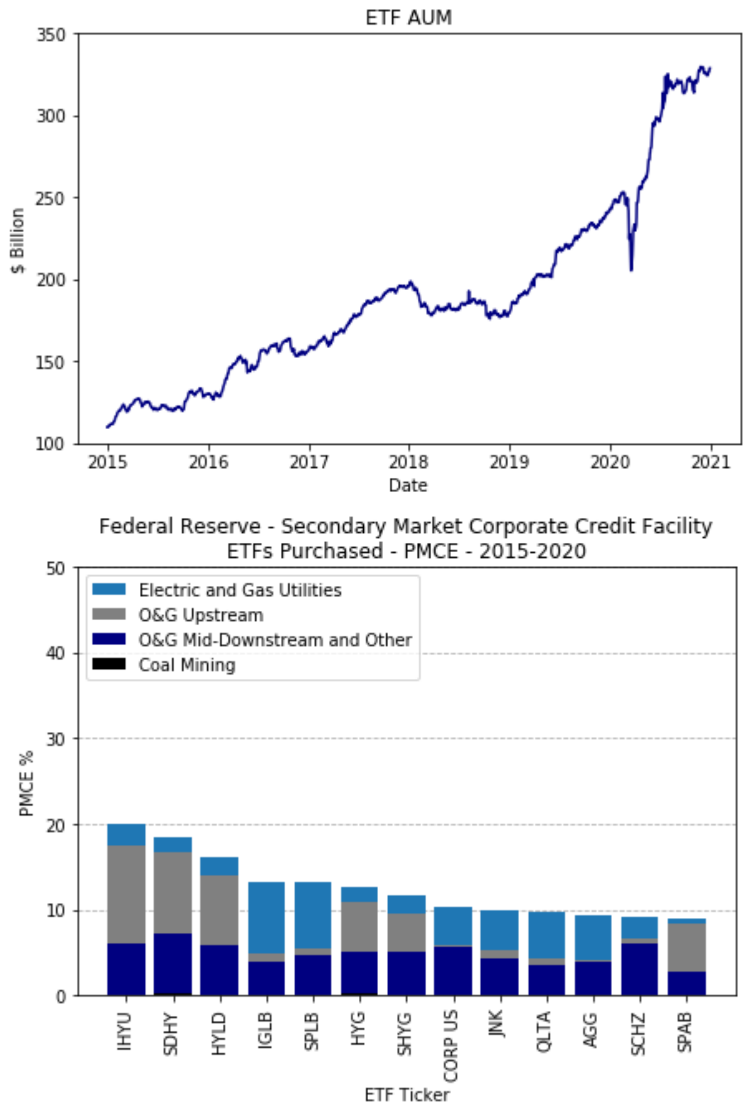


Figure 6. ETFs and the Federal Reserve.
Source. Data from Eikon, Bloomberg, and the Federal Reserve.
Note. In 2020 the Federal Reserve bought 16 corporate bond ETFs. Here 13 are shown, as two Vanguard ETFs do not provide daily holdings data and the VanEck Fallen Angels ETF did not meet the criteria for this analysis.

Chenet et al. (2020) argue that due to the potential severity of climate risk, and the radical uncertainty that prevents the accurate estimation of this risk, rather than focus on market-based solutions alone a precautionary market-shaping approach (Mazzucato, 2016) is needed to actively guide markets towards an optimal scenario where climate risks are mitigated. In line with this approach, the current structure of passive investing warrants attention by policymakers, with dominant passive products hardwired to finance carbon-intensive assets irrespective of climate risk.

In this context, actions to be considered by policymakers include supporting the development of low-carbon indices, for example through the EU Low Carbon Benchmark Regulation. Similarly, asset owners can be encouraged to set low-carbon funds and benchmarks as the default choice for savers. Policies such as Article 173 in France that requires institutional investors to report on climate-related exposures (Mésonnier & Nguyen, 2021) and the EU Sustainable Finance Disclosure Regulation (SFDR) that requires environmental financial products to disclosure the proportion of investments that are sustainable (European Commision, 2020), could be extended to require investors to report on their financing activities through primary markets, for example through metrics such as PMCE. This transparency could promote the integration of climate factors into primary market investment decisions, in turn incentivising companies to remain eligible for financing from investors with Paris alignment commitments. Applied to passive funds, this could enable the differentiation between similar index tracking funds.

6. Conclusion

This paper has outlined why a focus on portfolio flows is necessary to align the financial system with the Paris Agreement. Although measures of climate alignment based on portfolio holdings provide insights into climate risk, this is not the same as tracking Alignment with Climate Outcomes, as improvements secured through secondary markets bypass the real economy. Therefore, investors need to track portfolio flows, with primary markets able to finance new infrastructure and alter the cost of capital obtained by companies.

Portfolio flows must be decarbonised well before 2050 to avoid carbon lock-in and reduce systemic climate risk (Quigley et al., 2020). A system-wide focus on primary markets by investors could act as a Sensitive Invention Point in the net zero carbon transition (Farmer et al., 2019). For example, the introduction of primary market metrics into reporting frameworks could accelerate the pricing of climate externalities in primary markets and amplify pressure on companies to remain eligible for Paris-aligned finance.

In this context, we have shown that US corporate bond ETFs allocated 13.6% of their primary market portfolio flows to carbon-intensive sectors from 2015 to 2020, with 0.04% in coal mining, 3.8% in upstream oil & gas, 5.3% in mid and downstream oil & gas, and 4.4% in electric and gas utilities. Furthermore, ETFs bought by the Federal Reserve in 2020 allocated 13% of primary market investments to carbon-intensive sectors. Given the growing power of passive investing, this presents two issues for policymakers. First, will the efficacy of climate-related disclosures be limited? And second, will the financing activities of passive funds result in carbon-lock?

As primary markets can be considered the point of maximum leverage, ETF providers serious about climate change must consider how they can align portfolio flows. For ETFs that track carbon-intensive indexes, this is crucial. Although these funds may hold carbon-intensive assets to reduce tracking error relative to an index, this does not prevent a reduction in carbon-intensive financing through primary markets.

Appendix A - ETFs in Scope

Ticker	Name	AUM ($m)	US CORP AUM ($m)	PMCE 2015-2020
LQD	iShares iBoxx $ IG Corp Bond ETF	56297	48536	9.2%
HYG	iShares iBoxx $ HY Corp Bond Fund	27959	24852	20.0%
AGG	iShares Core US Aggregate Bond ETF	80735	23025	14.1%
IGSB	iShares 1-5 Year IG Corp ETF	20333	15310	9.4%
JNK	SPDR Bloomberg Barclays HY Bond ETF	12998	11204	16.2%
LQDE	iShares $ Corp Bond UCITS ETF	7961	9443	9.7%
IGIB	iShares 5-10 Year IG Corp Bond ETF	11677	9331	13.3%
IHYU	iShares $ HY Corp Bond ETF	4979	6570	29.1%
HYLB	Xtrackers $ HY Corp Bond ETF	6774	5977	-
SPSB	SPDR Portfolio Short Term Corp Bond ETF	6815	5642	10.4%
USHY	iShares Broad $ High Yield Corp Bond ETF	6233	5519	11.7%
SPIB	SPDR Portfolio Intermediate Term Corp Bond ETF	6154	5352	9.9%
USIG	iShares Broad $ IG Corp Bond	5753	4744	13.2%
SHYG	iShares 0-5 Year High Yield Corporate Bond ETF	5025	4454	18.5%
SDIG	iShares $ Short Duration Corp Bond ETF	2096	4368	8.8%
SJNK	SPDR Bloomberg Barclays Short Term HY Bond ETF	3579	3117	12.7%
SCHZ	Schwab US Aggregate Bond ETF	8300	2165	13.7%
CORP LN	iShares Global Corp Bond ETF	1389	1930	7.7%
SLQD	iShares 0-5 Year IG Corp ETF	2018	1658	9.8%
IGLB	iShares 10+ Year IG Corp Bond ETF	1814	1599	23.2%
IUSB	iShares Core Total $ Bond Market ETF	5452	1571	12.7%
ISTB	iShares Core 1-5 Year USD Bond ETF	4622	1499	12.7%
XDGU	Xtrackers $ Corp Bond ETF	1048	1457	-
SPAB	SPDR Portfolio Aggregate Bond ETF	5512	1378	13.3%
QLTA	iShares Aaa - A Rated Corp Bond ETF	1474	1296	14.7%
IBCQ	iShares Global Corp Bond EUR Hedged ETF	1808	1116	6.8%
HYLD	iShares Global HY Corp Bond ETF	743	1055	24.8%
STHY	PIMCO US Short Term HY Corp Bond ETF	372	937	-
SDHY	iShares $ Short Duration HY Corp Bond ETF	720	880	25.2%
SPLB	SPDR Portfolio Long Term Corp Bond ETF	881	824	20.0%
PHB	Invesco Fundamental HY Corp Bond ETF	783	771	-
HYS	PIMCO 0-5 Year High Yield Corp Bond ETF	1174	770	-
GVI	iShares Intermediate Government/Credit Bond ETF	2283	740	11.7%
CORP US	PIMCO IG Corp Bond Index ETF	808	576	17.0%
GIGB	Goldman Sachs Access IG Corp Bond ETF	651	568	-

Source. Data from Bloomberg.
Note. PMCE is only shown for ETFs with over 100 primary market trades identified.

Appendix B - TRBC Activity Classifications

Electric and Gas Utilities	Electric Utilities (NEC), Electric Power Plant Construction, Fossil Fuel Electric Utilities, Independent Power Producers (NEC), Fossil fuel IPPs, Natural Gas Utilities (NEC), Natural Gas Distribution
O&G Upstream	Oil Related Services and Equipment (NEC), Oil Related Services, Oil & Gas Transportation Services (NEC), Oil & Gas Refining and Marketing (NEC), Natural Gas Pipeline Transportation, LNG Transportation & Storage, Oil Pipeline Transportation, Petroleum Refining, Petroleum Product Wholesale, Integrated Oil & Gas
O&G Mid-Downstream	Oil & Gas Exploration and Production (NEC), Oil Exploration & Production - Onshore, Oil & Gas Drilling (NEC), Oil Drilling - Offshore, Unconventional Oil & Gas Production, Natural Gas Exploration & Production - Onshore
Coal Mining	Coal (NEC), Coke Coal Mining, Coal Mining Support

Appendix C – ETF Share of Demand by Rating

2015-2020		Aggregate ETF Trades					
		All	IG	HY	US	US IG	US HY
No. Bond Issues	Carbon-Intensive	1440	1112	315	1148	876	268
	Ex-Carbon-Intensive	8545	6480	1955	5752	4417	1260
ETF Share of New Issue Demand	Carbon-Intensive	0.76%	0.53%	1.49%	0.85%	0.59%	1.63%
	Ex-Carbon-Intensive	0.64%	0.53%	0.99%	0.76%	0.63%	1.22%
	Difference	0.12%	-0.00%	0.50%	0.08%	-0.04%	0.41%
	Difference P-Value	0.00	0.85	0.00	0.00	0.12	0.00
Issue Size ($ Million)	Carbon-Intensive	779	790	742	739	731	754
	Ex-Carbon-Intensive	1017	1074	824	1027	1087	825
	Difference	-238	-284	-82	-288	-356	-71
	Difference P-Value	0.00	0.00	0.00	0.00	0.00	0.00

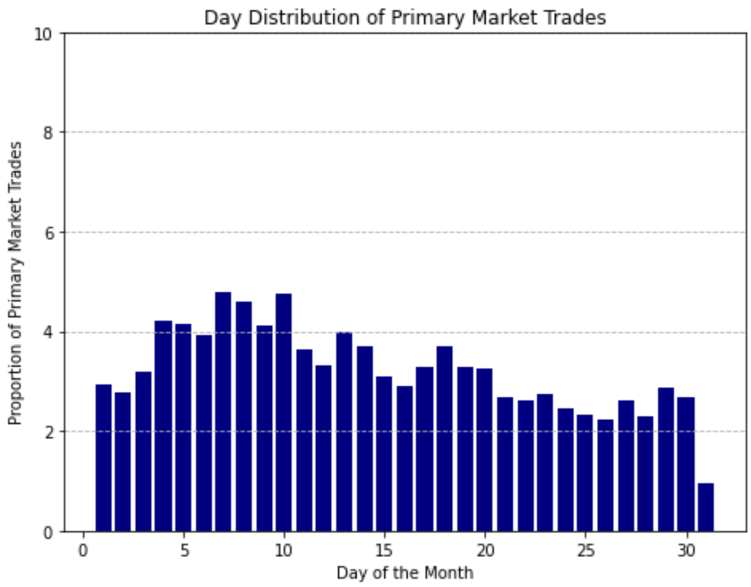
Source. Data from Eikon and Bloomberg.
Note. Aggregate ETF trades combine trades in the same new issue across ETFs in the sample, first across all new issues and then those in bonds issued by US companies in USD. The average combined share of new issue demand is then reported, comparing carbon-intensive and non-carbon-intensive issues according to TRBC activity. The average size of new bonds issued is then also compared across carbon-intensive and non-carbon-intensive sectors.

Appendix D - ETF Share of Demand by Sector

	IG		HY	
	Prop of NI	Frequency	Prop of NI	Frequency
Communication Services	0.65%	7.73%	1.24%	12.95%
Consumer Discretionary	0.49%	6.75%	1.33%	11.51%
Consumer Staples	0.59%	6.39%	1.05%	2.88%
Energy	0.49%	5.15%	1.74%	11.97%
Financials	0.75%	35.71%	1.21%	23.54%
Health Care	0.49%	8.41%	1.23%	6.08%
Industrials	0.51%	10.16%	1.20%	14.13%
Information Technology	0.61%	4.09%	1.11%	1.57%
Materials	0.65%	1.51%	1.19%	5.69%
Real Estate	0.50%	1.75%	1.08%	5.23%
Utilities	0.61%	12.36%	1.58%	4.45%

Source. Data from Eikon and Bloomberg.
Note. Trades in the same new issue across ETFs in the sample are combined to calculate the proportion of primary market demand from ETFs in the sample. The average share of demand is shown by industry under "Prop of NI". In the next column, "Frequency" shows the proportion of new issues in our sample by industry.

Appendix E – Distribution of Primary Market Trades by Day of the Month



Source. Data from Eikon and Bloomberg.

Notes

1. The Net-Zero Asset Owners Alliance include "Financing Transition Targets" but without a quantitative progress target.
2. A fall in equity prices can also reduce the ability of a company to achieve growth through M&A.
3. The three ETFs that are not covered by this paper include VanEck Vectors Fallen Angel High Yield Bond ETF that covers only downgraded investment grade bonds. The other two ETFs are Vanguard Intermediate-Term Corporate Bond ETF and Vanguard Short-Term Corporate Bond ETF. These ETFs only disclose monthly holdings and are therefore not used.

Declaration of Conflicting Interests

None. There are also no sources of funding to declare.

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