S&P Dow Jones Indices

A Division of S&P Global

Research

A Look inside Green Bonds: Combining Sustainability with Core Fixed Income

Contributors

Aye M. Soe, CFA
Managing Director
Global Research & Design
aye.soe@spglobal.com

Hong Xie CFA
Senior Director
Global Research & Design
hong.xie@spglobal.com

Brian Luke, CFA
Senior Director
Product Management
brian.luke@spglobal.com

Kevin Horan
Director
Product Management
kevin.horan@spglobal.com

In recent years, an increasing number of market participants have shown interest in sustainability-driven investing and have started to incorporate elements of environmental, social, and governance (ESG) factors in their investment processes. Various rationales have been given for the inclusion of these factors.

The first rationale is that from a risk/return perspective, companies that consider impact investing and ESG practices associated with their business activities are likely to be ahead of their peers.[1] From an environmental standpoint, actively managing a portfolio's footprint may help decrease exposure to companies that may face legal and reputational risks and provide a hedge against future regulatory changes. For example, as the world transitions to a low-carbon economy, organizations that have been proactive will be better positioned to adapt to new regulations, innovation, or a shift in consumer appetite.[2]

The second rationale for investing in these types of companies comes from social or personal values and goals. These investors aim to create portfolios that balance financial returns within the scope of mission objectives.

No matter the rationale, there is a wide range of options for fixed income market participants to navigate. A common approach to navigating among these options has been to rely on evaluation metrics, or ratings that measure the ESG impact of companies' operations, and overlaying the score onto assets. The main challenge of this approach is that currently there is no clear standard of measurement in the market.

Researchers at MIT who worked on the Aggregate Confusion Project found that when they compare "two of the top five ESG rating agencies and compute the rank correlation across firms in a particular year, we are likely to obtain a correlation of the order of 10 to 15 percent. At least the correlation is positive! It is very likely (about 5 to 10 percent of the firms)

[1] "How Does S&P Global Ratings Incorporate Environmental, Social, And Governance Risks Into Its Ratings Analysis." https://www.brookings.edu/wp-content/uploads/2018/01/epdf_spg-esg-risks-into-ratings-analysis_final.pdf

[2] Bernick, Libby, Steven Bullock, and Rick Lord. "Carbon Pricing: Discover Your Blind Spots on Rick and Opportunity." https://spdji.com/documents/research/research-carbon-pricing-discover-your-blind-spots-on-risk-and-opportunity.pdf

that the firm that is in the top 5 percent for one rating agency belongs to the bottom 20 percent for the other."[3]

Green bonds play an important role in tapping the financial markets to aid in the transition to a low-carbon economy.

Within fixed income, green bonds could solve this problem and offer an opportunity for market participants to add an element of impact investing into their core exposure in a simple way. Furthermore, compared to other environmental indicators available, green bonds are arguably the most forward-looking measure.

GREEN BONDS – AN OVERVIEW

Green bonds are vanilla fixed income assets issued to fund projects that have environmental or climate benefits. Prior to the emergence of green bonds, there was little focus on the use of proceeds and many bonds indicated "general purpose" with little oversight on the eventual usage of the proceeds. The majority of the green bonds issued are green use of proceeds bonds. These bonds carry the credit risk of the issuer, however, they differ from traditional bonds in that the proceeds from these bonds are earmarked for investments in projects that have environmental benefits.

The green bond principles provide issuers a roadmap to launching a credible green bond…

There are also green bonds with direct credit exposure to projects and revenue streams. Some examples of different green products include municipal revenue bonds, securitized bonds with exposure to bills, receivables, auto loans, and mortgage-backed securities (MBS), as well as project bonds. Green bonds play an important role in tapping the financial markets to aid in the transition to a low-carbon economy. However, since green bonds are self-identified by the issuer, market participants require transparency around the use of proceeds and a standardized way to evaluate the impact of the investments.

…while helping to ensure that investors have information to evaluate the environmental impact of investments.

In 2014, the International Capital Market Association (ICMA) set out to do that by helping establish the Green Bond Principles (GBP). According to the ICMA, "the principals are voluntary process guidelines that recommend transparency and disclosure and promote integrity in the development of the Green Bond market by clarifying the approach for issuance of a Green Bond."[4] The guidelines provide issuers a roadmap to launching a credible green bond, and they help investors by ensuring availability of information necessary to evaluate the environmental impact of their green bond investments.

Over the years, various institutions have incorporated the GBP in the taxonomy of their bond databases. Among them is the Climate Bonds Initiative (CBI), a non-profit organization that provides a database of all bonds that are aligned with the GBP and their own taxonomy assessed on an ongoing basis. The CBI's taxonomy provides an opinion on what is

[3] MIT Aggregate Confusion Project. http://web.mit.edu/rigobon/www/aggregate-confusion-project.html

[4] ICMA Group Green Bond Principles. https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/

considered legitimate use of proceeds from green bonds. The CBI Markets Team also reviews for alignment with the GBP and may engage third-party experts for confirmation.

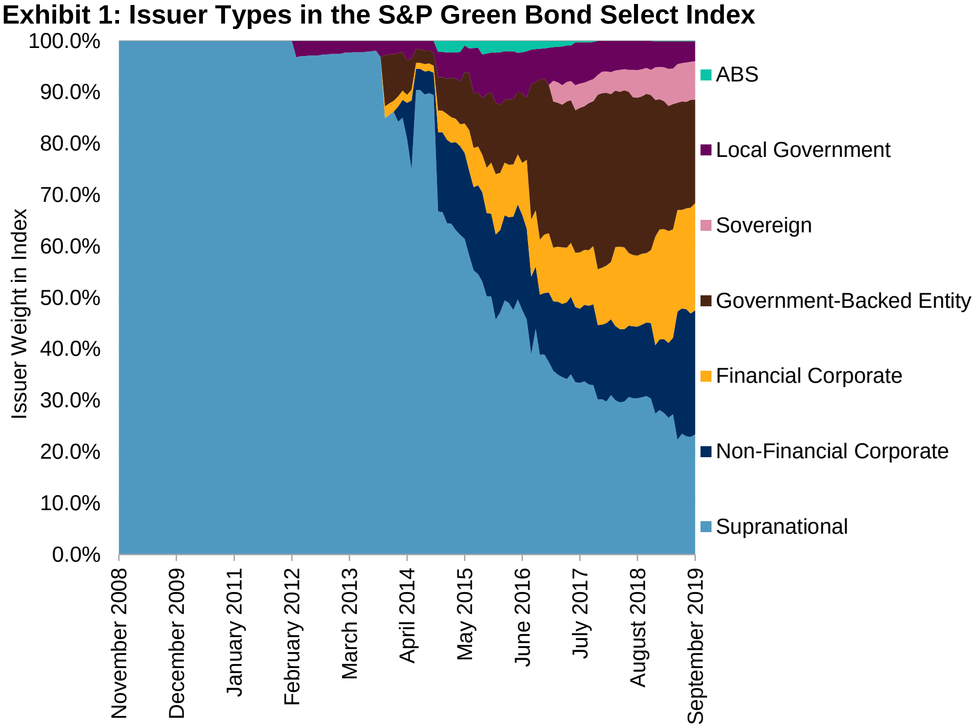
The green bond market has diversified to include bonds from the major core segments of the global fixed income universe.

The green bond market has diversified to include bonds from the major core segments of the global fixed income universe. Development banks and other major international financial institutions, such as the European Investment Bank, World Bank, and the International Bank for Reconstruction and Development, were among the first issuers of green bonds.

Corporates, banks, and municipalities have increasingly recognized green bond issuance as a means to fund their environmental projects.

Over the past few years, the market diversified by issuer type, country of domicile, and risk currency. Corporates, banks, and municipalities have increasingly recognized green bond issuance as a means to fund their environmental projects. Exhibit 1 illustrates the diversification of issuer types over time.

Exhibit 1: Issuer Types in the S&P Green Bond Select Index



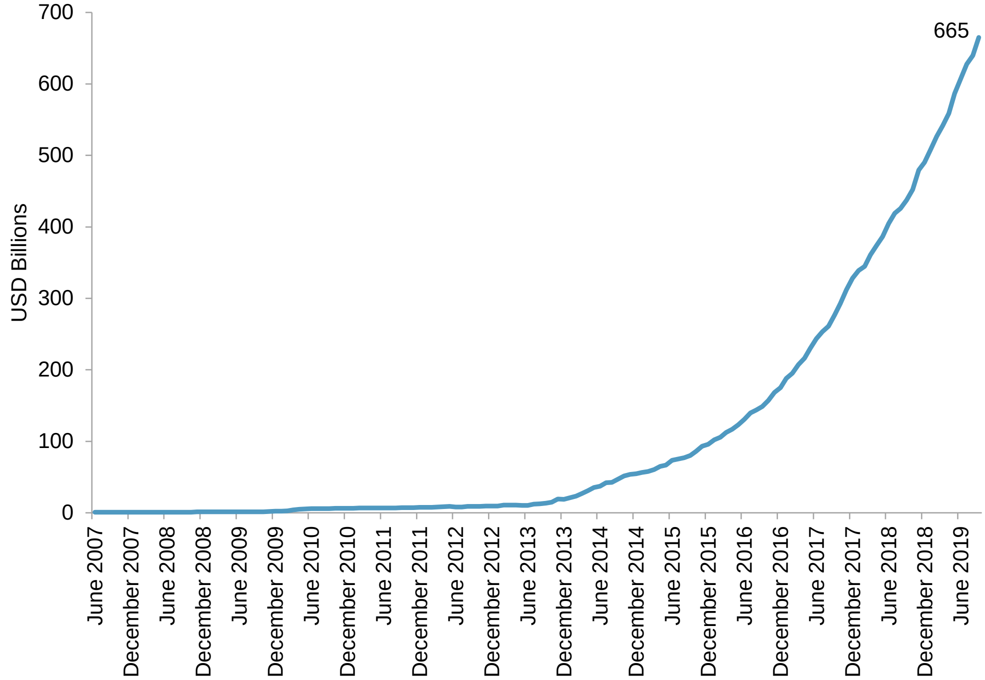
Source: S&P Dow Jones Indices LLC and CBI. Data as of Sept. 30, 2019. Chart is provided for illustrative purposes. Fixed income sectors based on CBI designation.

GREEN BONDS – HISTORY AND GROWTH

The first green bonds were issued in 2007 by the European Investment Bank. Supranationals and development banks, such as the World Bank and African and Asian development banks, dominated the scene through 2013. The pace of issuance picked up in 2013, and the issuer base diversified to include non-financial corporates. The largest green bond issued at that time was by a corporate for USD 1.9 billion. The bond was issued by a French consumer energy company, and it helped bring the net market size to USD 19 billion by the end of 2013. Other corporates began to see potential for a new funding source for their climate goals through the nascent market, and by year-end 2014, the market size had more than doubled to USD 54 billion (see Exhibit 2). Since then, the issuance has grown exponentially and as of September 2019 was at a record level of USD 665 billion.

In June 2013, the first tax-exempt U.S. municipal green bond was issued by the Commonwealth of Massachusetts.

Exhibit 2: Green Bond Market Size



Source: S&P Dow Jones Indices LLC and CBI. Data as of Sept. 30, 2019. Chart is provided for illustrative purposes.

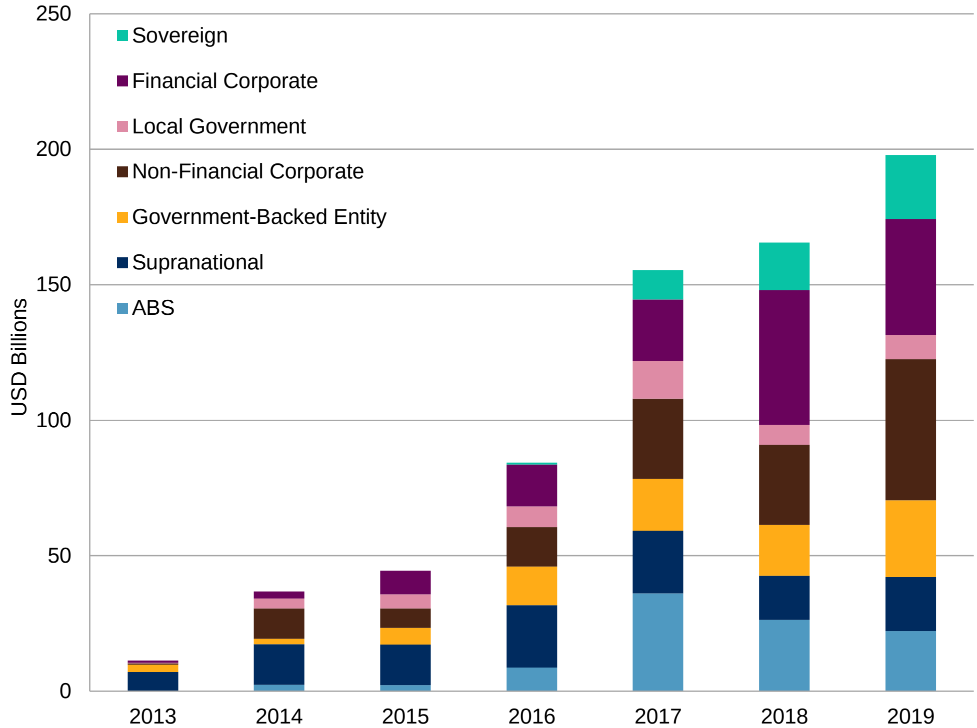
Solar City kicked off the green ABS issuance in 2013 with a USD 54 million issuance.

Municipal and local governments have also recognized green bonds as a means to fund environmental projects. The first green bond issued by a local authority was by the Île De France region in March 2012. In June 2013, the first tax-exempt U.S. municipal green bond was issued in the form of a general property tax obligation bond by the Commonwealth of Massachusetts. New York, Washington D.C., and California, among others, entered the market in 2013.

Solar City (Tesla Energy) kicked off the green ABS issuance in 2013 with a USD 54 million issuance, which was backed by a portfolio of solar panel systems, related contractual customer payments, and performance-based incentive payments. Bond investors would be paid by the lease payment cash flows. Toyota followed suit when it issued a USD 1.75 billion auto receivables-backed bond. The net proceeds to Toyota Motor Credit Corporation were earmarked to be applied exclusively to finance originations of loans and leases for gas-electric hybrids or alternative fuel vehicles that met certain specified criteria.

Sovereign issuers entered the market in 2016 and continued to grow the issuance.

Exhibit 3: Green Bond Annual Gross Issuance



Source: S&P Dow Jones Indices LLC and CBI. Data as of Sept. 30, 2019. Chart is provided for illustrative purposes.

Most recently, sovereign issuers entered the market. Poland was the first to market in December 2016 with an issuance of EUR 750 million of sovereign credit (external debt). France came to market with the largest issue on record of EUR 7 billion (USD 7.6 billion) in January 2017 and re-tapped the market two more times in 2017, increasing the size of the bond to USD 10.7 billion. Since then, the bond has been tapped twice in 2018 and three times in 2019, and it is currently at USD 23.3 billion outstanding. By the end of 2018, sovereign bonds from Belgium, Fiji, Indonesia, Ireland, Lithuania, Nigeria, and Seychelles helped push the category to USD 29 billion. The CBI estimates that the trend will persist beyond 2019, as the YTD issuance was at USD 189 billion as of Sept. 30, 2019.[5]

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INDEX SOLUTIONS IN THE GREEN BOND MARKET

In 2014, S&P Dow Jones Indices collaborated with Infrastructure Credit Alpha Group LLC in designing the S&P Green Bond Index with the objective of providing the investment community with a rules-based, transparent benchmark that is designed to measure the performance of the global green bond market. To ensure that the bonds selected are part of the move to a low-carbon economy, S&P DJI uses the green flag by the CBI, leveraging their independent, expert-led guidance on which investments are part of that movement.

[5] https://www.climatebonds.net/

The index is designed to measure the performance of green-labeled bonds issued globally, subject to additional eligibility criteria…

Subsequently, in February 2017, the S&P Green Bond Select Index was launched. The index is designed to measure the performance of green-labeled bonds issued globally, subject to additional eligibility criteria including minimum amount outstanding and market of issuance to ensure replicability and investability. As of Sept. 30, 2019, the S&P Green Bond Select Index accounted for 8% of the bonds by count (454 bonds) and about 69% by market value (USD 347 billion) of the broader S&P Green Bond Index.

Exhibit 4: Green Bond Index Construction

INCLUSION CRITERIA	S&P GREEN BOND INDEX	S&P GREEN BOND SELECT INDEX
Eligible Criteria	CBI Green Flag	Member of S&P Green Bond Index
Size Criteria	None	Minimum Par by Currency (See methodology for details)
Liquidity Criteria	None	Issued in Developed or Global Market
Member Selection Criteria	None	Taxable Bonds Only
Maturity	None	Must Have 2 Years to Maturity at Issuance
Coupon Type Restrictions	None	Floating Rate Notes
Rating Restriction	None	Rated by at Least One Rating Agency (S&P Global Ratings, Moody's, or Fitch)
Rebalance Frequency	Monthly	Monthly
Weighting Method	Market Weight	Market Weight
Weight Caps	None	10% per Issuer / 20% Total High Yield
Number of Index Members	5,440	454 (8% of the bonds in the parent index)
Market Value (USD Billions)	505.2	347.8 (69% of the market value of the parent index)

Source: S&P Dow Jones Indices LLC. Data as of Sept. 30, 2019. Table is provided for illustrative purposes. For more information, see the S&P Green Bond Indices Methodology.

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GREEN BONDS IN THE PORTFOLIO CONTEXT

Market participants who consider environmental impact in their investment decision process, whether from a risk mitigation standpoint or values perspective, typically take one of two main approaches to investing. The classic approach is exclusion of companies that engage in activities that cause environmental harm. This type of approach requires the fund to avoid investing in companies with activities that cause environmental harm, such as coal mining.

However, the downside of this classic approach is that excluding entire industries or sub-sectors of the investment universe might be less appealing to institutional investors who are subject to tracking error constraints. One way to address the tracking error issue is to tilt the portfolio in favor of environmentally friendly companies and tilt away from unfriendly ones by reducing their allocation in the portfolio. Lower allocation, if broadly adopted, could pressure companies into adopting positive behavior and reduce the portfolio's exposure to legal and reputational risks or hedge against future regulatory changes.

The second, equally stringent approach is to only include those companies that actively support the move toward a more sustainable or low-carbon economy. Instead of excluding companies that engage in ecologically harmful business activities, the portfolio would only include assets from companies with positive ecological business practices.

Green bonds are able to offer market participants several benefits when viewed through environmental and diversification lenses.

Using the second approach may be more desirable, as green bonds are able to offer market participants several benefits when viewed through environmental and diversification lenses. One benefit is that proceeds from the bonds are used to improve the ecological impact of the issuer's business activity, regardless of the nature of their activity. For example, an energy generation company with heavy reliance on coal may use green bond issuance to fund its transition to renewable energy sources. Therefore, the activist can rest assured that their investment is being used to advance their mission goals without having to exclude sectors, which may increase tracking error. Another benefit is that the issuer of a green bond is likely positioning itself in a way that reduces risk exposure to future regulatory changes. A third benefit is that, unlike scores that are based on reported emissions or surveys of past behavior, green bonds are about funding future projects.

Therefore, including companies that actively support the move toward a more sustainable economy provides a diverse mix of issuer types and a strong way to use green bonds as a method to gain global bond market exposure. We explore this part in greater detail in the next section.

COMPARING GREEN BONDS TO THE GLOBAL CORE BENCHMARK

Unlike scores that are based on reported emissions or surveys of past behavior, green bonds are about funding future projects.

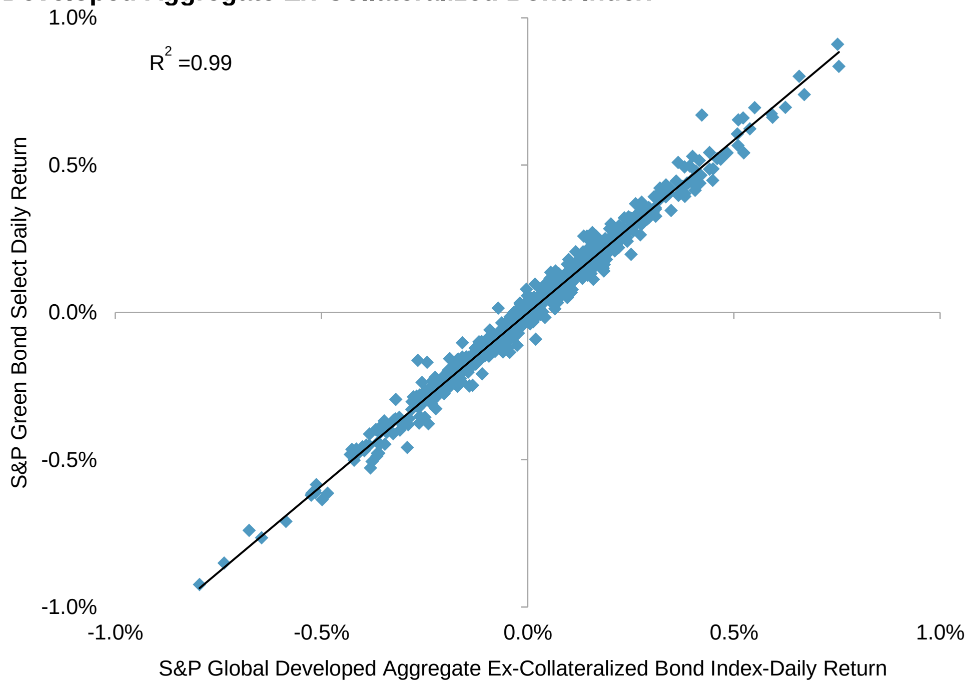
The green bond market includes all issuer types across countries, currencies, and credit quality, resembling the core global bond market (see Exhibit 1). Despite this diversity of bond types in the green market, the mix of assets is different than that of a global core index, such as the S&P Global Developed Aggregate Ex-Collateralized Bond Index. **Focusing on the investable portion of the taxable universe, one can consider the S&P Green Bond Select Index as a strong potential alternative for a portion of core fixed income exposure.**

The two indices are relatively similar in terms of characteristics and performance, which means that market participants looking to green up their portfolio may not need to sacrifice much (and may actually outperform the core). As of Sept. 30, 2019, the two indices were relatively similar with respect to duration and yields.[6] Since the launch of the S&P Green Bond Select Index on Feb. 17, 2017, its performance has been highly correlated to the S&P Global Developed Aggregate Ex-Collateralized Bond Index. In fact, over the same period, the S&P Green Bond Select Index outperformed, returning 0.5% more than the S&P Global Developed Aggregate Ex-Collateralized Bond Index.[7]

Since its launch, the S&P Green Bond Select Index's performance has been highly correlated to the S&P Global Developed Aggregate Ex-Collateralized Bond Index…

Regressing the daily returns of the S&P Green Bond Select Index against the S&P Global Developed Aggregate Ex-Collateralized Bond Index since the former's launch, there was a 0.99 correlation (see Exhibit 5). On a YTD return basis, the S&P Green Bond Select Index outperformed the S&P Global Developed Aggregate Ex-Collateralized Bond Index by 78 bps (5.42% versus 4.63%, respectively) as of Sept. 30, 2019 (see Exhibit 6).

Exhibit 5: S&P Green Bond Select Index Returns Track the S&P Global Developed Aggregate Ex-Collateralized Bond Index



…with a correlation of 0.99 between the two over that period.

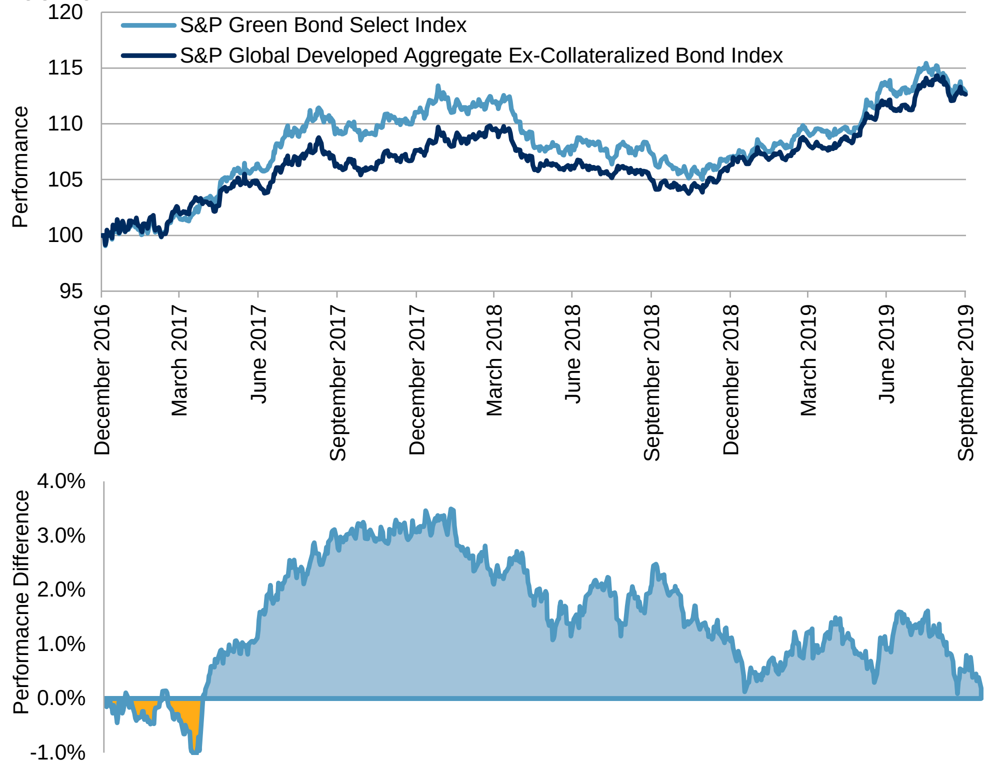
Source: S&P Dow Jones Indices LLC. Data from Feb. 17, 2017, to Sept. 30, 2019. Past performance is no guarantee of future results. Chart is provided for illustrative purposes. The S&P Green Bond Select Index (USD) TR is regressed against the S&P Global Developed Aggregate Ex-Collateralized Bond Index (USD).

[6] As of Sept. 30, 2019, the modified duration, yield-to-worst (YTW), and yield-to-maturity (YTM) for the S&P Global Developed Aggregate Ex-Collateralized Bond Index were 7.2, 1.04% and 1.05%, respectively. The modified duration, YTW, and YTM for the S&P Green Bond Select were 7.4%, 0.9%, and 0.92%, respectively.

[7] From Feb. 17, 2018, through Sept. 30, 2018, the periodic return of the S&P Global Developed Aggregate Ex-Collateralized Bond Index was 11.6%, while the S&P Green Bond Select Index returned 12.1%. Returns are in USD.

Sovereign bonds made up 15.7 % of the S&P Green Bond Select Index…

Exhibit 6: S&P Green Bond Select Index (TR) versus S&P Global Developed Aggregate Ex-Collateralized Bond Index



Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2016, to Sept.30, 2019. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. The S&P Green Bond Select Index (USD) TR and S&P Global Developed Aggregate Ex-Collateralized Bond Index (USD).

…while the sovereign component of the S&P Global Developed Aggregate Ex-Collateralized Bond Index totaled 63%.

The biggest difference between the two indices is in the sovereign component. As of Sept. 30, 2019, sovereign bonds made up 15.7 % of the S&P Green Bond Select Index. France is the largest issuer (7.8%) followed by Belgium (2.6%) and the Netherlands (2.1%); the remaining issuers are Poland, Ireland, Chile, and Hong Kong. In contrast, the sovereign component of the S&P Global Developed Aggregate Ex-Collateralized Bond Index totaled 63% (see Exhibit 7).

Exhibit 7: Holdings Comparison

ISSUER TYPE	S&P Global Developed Aggregate Ex-Collateralized Bond Index	+/- (%)	S&P GREEN BOND SELECT INDEX
Supranational	1.8%		21.9%
Non-Financial Corporate	13.1%		23.2%
Government-Backed Entity	7.1%		15.9%
Financial Corporate	11.9%		19.6%
Local Government	2.5%		3.5%
Sovereign	63.6%		15.9%

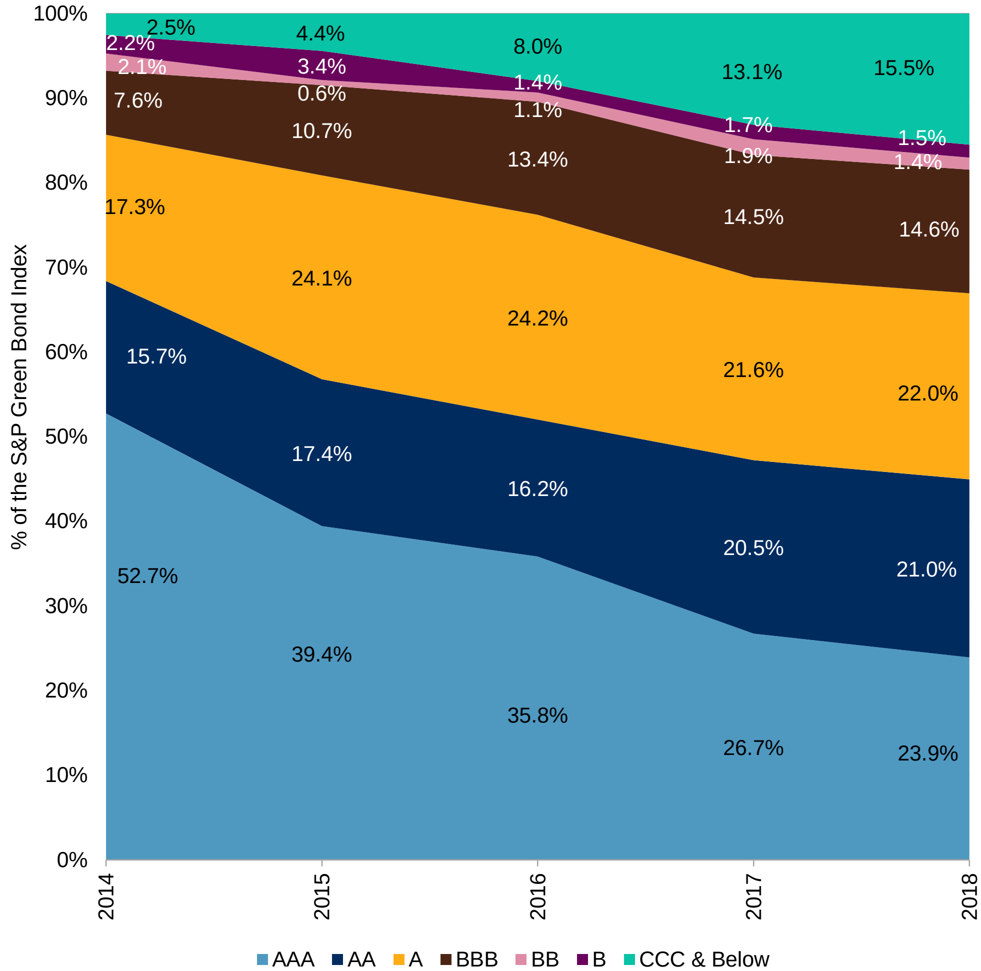
Source: S&P Dow Jones Indices LLC. Data as of Sept. 30, 2019. Table is provided for illustrative purposes. Fixed income sectors based on CBI classification.

Looking more closely at the S&P Green Bond Select Index composition, local governments, government-backed entities, and supranationals represented 42% of the index as of Sept. 30, 2019 (down from 70% at the index launch in February 2017; see Exhibit 7).

Continued record issuance of green bonds over the last five years has led to the characteristics of this type of fixed income product to evolve closer to the characteristics of the broader market. The issuers' ratings in the S&P Green Bond Index have transitioned away from its historic heavy weight in 'AAA' to the current ratings breakdown, as seen in Exhibit 8.

Continued record issuance of green bonds over the last five years has led to the characteristics of this type of fixed income product to evolve closer to the characteristics of the broader market.

Exhibit 8: S&P Green Bond Index – Transitioning Ratings History



Source: S&P Dow Jones Indices LLC. Yearly data as of Dec. 31, 2018. Chart is provided for illustrative purposes.

Therefore, market participants that have been looking for a way to diversify their core fixed income may wish to consider green bonds.

Exhibit 9: S&P Green Bond Indices versus Benchmark

PERIOD	S&P GREEN BOND INDEX	S&P GREEN BOND SELECT INDEX	S&P GLOBAL DEVELOPED AGGREGATE EX-COLLATERALIZED BOND INDEX	S&P GREEN BOND INDEX	S&P GREEN BOND SELECT INDEX
	ANNUALIZED RETURN (%)			ANNUALIZED EXCESS RETURN (%)	
1-Year	4.7	5.0	7.1	-2.2	-2.0
3-Year	6.5	6.7	4.1	0.8	0.8
5-Year	4.4	5.2	9.0	-0.9	-0.7
	ANNUALIZED VOLATILITY (%)			TRACKING ERROR (%)	
1-Year	3.2	4.0	3.4	1.7	1.9
3-Year	4.0	4.6	4.4	1.7	1.9
5-Year	4.8	5.3	5.0	2.1	2.2
	RISK-ADJUSTED RETURN			INFORMATION RATIO	
1-Year	1.46	1.25	2.08	-1.33	-1.06
3-Year	1.62	1.45	0.92	0.46	0.44
5-Year	0.93	0.98	1.81	-0.41	-0.32
	12-MONTH MAX DRAWDOWN (%)			BETA	
5-Year	-11.2	-11.1	-9.6	0.87	0.97

Source: S&P Dow Jones Indices LLC. Data as of Sept. 30, 2019. Past performance is no guarantee of future results. Table is provided for illustrative purposes. Annualized return based on USD versions of indices.

Green bonds are a strong option, as they have a clearer standard of measurement than other options…

GREEN BONDS – CONCLUSIONS

An increasing number of market participants have shown interest in sustainability-driven investing, and there are a wide range of fixed income options to choose from. Green bonds are a strong option, as they have a clearer standard of measurement (compared with other options) and they are arguably a more forward-looking measure.

The S&P Green Bond Index provides a rules-based, transparent benchmark to measure the performance of the global green bond market. It is relatively similar to the global core benchmark in terms of characteristics and performance, which means that market participants looking to green up their portfolio may not need to sacrifice much (and may actually outperform the core).

…and are arguably a more forward-looking measure.

While there are some differences between the S&P Green Bond Index and the global core, the green market is evolving toward a global core in terms of sector and issuer exposures as issuance continues. Adding green bonds may provide the additional benefit of increasing social awareness while still capturing a global bond allocation.

S&P DJI RESEARCH CONTRIBUTORS		
Sunjiv Mainie, CFA, CQF	Global Head	sunjiv.mainie@spglobal.com
Jake Vukelic	Business Manager	jake.vukelic@spglobal.com
GLOBAL RESEARCH & DESIGN		
AMERICAS		
Sunjiv Mainie, CFA, CQF	Americas Head	sunjiv.mainie@spglobal.com
Laura Assis	Analyst	laura.assis@spglobal.com
Cristopher Anguiano, FRM	Analyst	cristopher.anguiano@spglobal.com
Phillip Brzenk, CFA	Senior Director	phillip.brzenk@spglobal.com
Smita Chirputkar	Director	smita.chirputkar@spglobal.com
Rachel Du	Senior Analyst	rachel.du@spglobal.com
Bill Hao	Director	wenli.hao@spglobal.com
Qing Li	Director	qing.li@spglobal.com
Berlinda Liu, CFA	Director	berlinda.liu@spglobal.com
Maria Sanchez	Associate Director	maria.sanchez@spglobal.com
Kunal Sharma	Senior Analyst	kunal.sharma@spglobal.com
Hong Xie, CFA	Senior Director	hong.xie@spglobal.com
APAC		
Priscilla Luk	APAC Head	priscilla.luk@spglobal.com
Arpit Gupta	Senior Analyst	arpit.gupta1@spglobal.com
Akash Jain	Associate Director	akash.jain@spglobal.com
Anurag Kumar	Senior Analyst	anurag.kumar@spglobal.com
Xiaoya Qu	Senior Analyst	xiaoya.qu@spglobal.com
Yan Sun	Senior Analyst	yan.sun@spglobal.com
Tim Wang	Senior Analyst	tim.wang@spglobal.com
Liyu Zeng, CFA	Director	liyu.zeng@spglobal.com
EMEA		
Andrew Innes	EMEA Head	andrew.innes@spglobal.com
Leonardo Cabrer, PhD	Senior Analyst	leonardo.cabrer@spglobal.com
Andrew Cairns	Senior Analyst	andrew.cairns@spglobal.com
Jingwen Shi	Analyst	jingwen.shi@spglobal.com
INDEX INVESTMENT STRATEGY		
Craig J. Lazzara, CFA	Global Head	craig.lazzara@spglobal.com
Chris Bennett, CFA	Director	chris.bennett@spglobal.com
Fei Mei Chan	Director	feimei.chan@spglobal.com
Tim Edwards, PhD	Managing Director	tim.edwards@spglobal.com
Anu R. Ganti, CFA	Director	anu.ganti@spglobal.com
Sherifa Issifu	Analyst	sherifa.issifu@spglobal.com

PERFORMANCE DISCLOSURE

The S&P Green Bond Select Index was launched on February 17, 2017. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. Complete index methodology details are available at www.spdji.com. Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at www.spdji.com for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

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