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A Look Inside Green Bonds: Combining Sustainability With Core Fixed Income

In recent years, an increasing number of market participants have shown interest in sustainability-driven investing and have started to incorporate elements of environmental, governance, and social (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 comparing "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) that the firm

[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] https://spindices.com/documents/research/research-carbon-pricing-discover-your-blind-spots-on-risk-and-opportunity.pdf

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

Within fixed income, green bonds can 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 play an important role in tapping the financial markets to aid in the transition to a low-carbon economy.

Green bonds are vanilla fixed income assets issued to fund projects that have positive 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.

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 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.

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

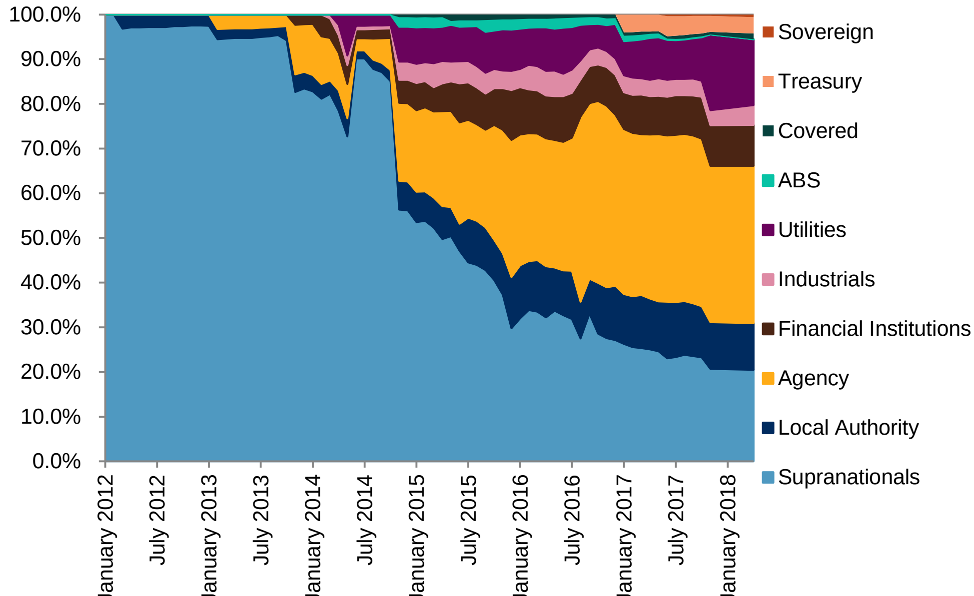
[4] ICMA Group Green Bond Principles. https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/

considered legitimate use of proceeds for 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. 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.

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



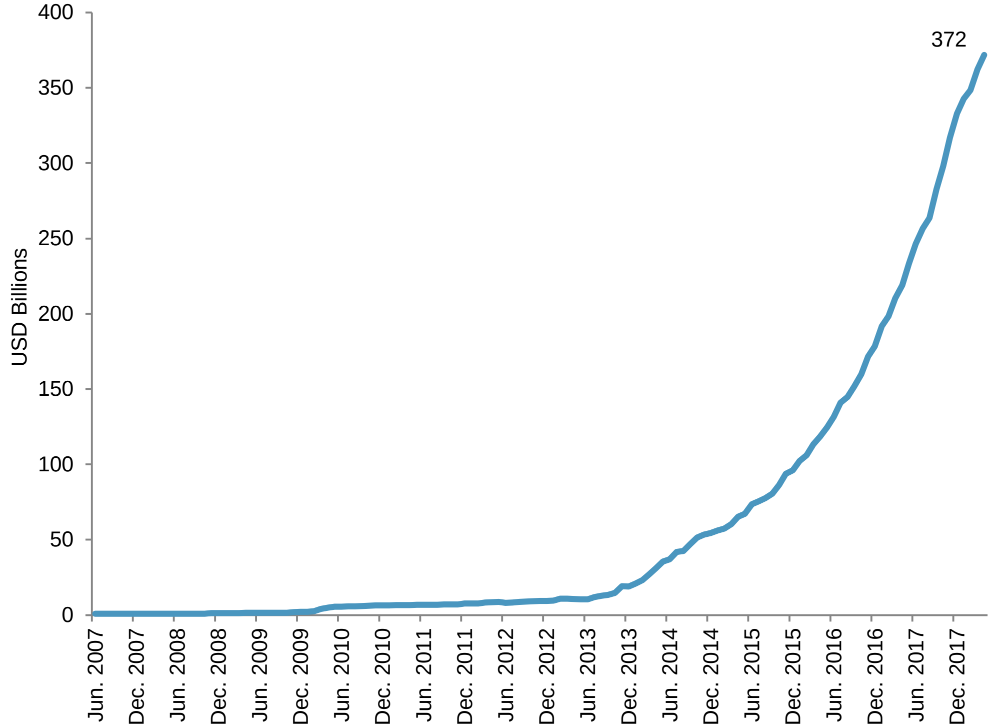
Source: S&P Dow Jones Indices LLC and Bloomberg L.P. Data as of April 30, 2018. Chart is provided for illustrative purposes. Fixed income sectors based on Bloomberg Barclays Level 2 classification.

GREEN BONDS – HISTORY AND GROWTH

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

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 mid-2014, the market size had doubled to USD 38 billion (see Exhibit 2).

Exhibit 2: Green Bond Market Size



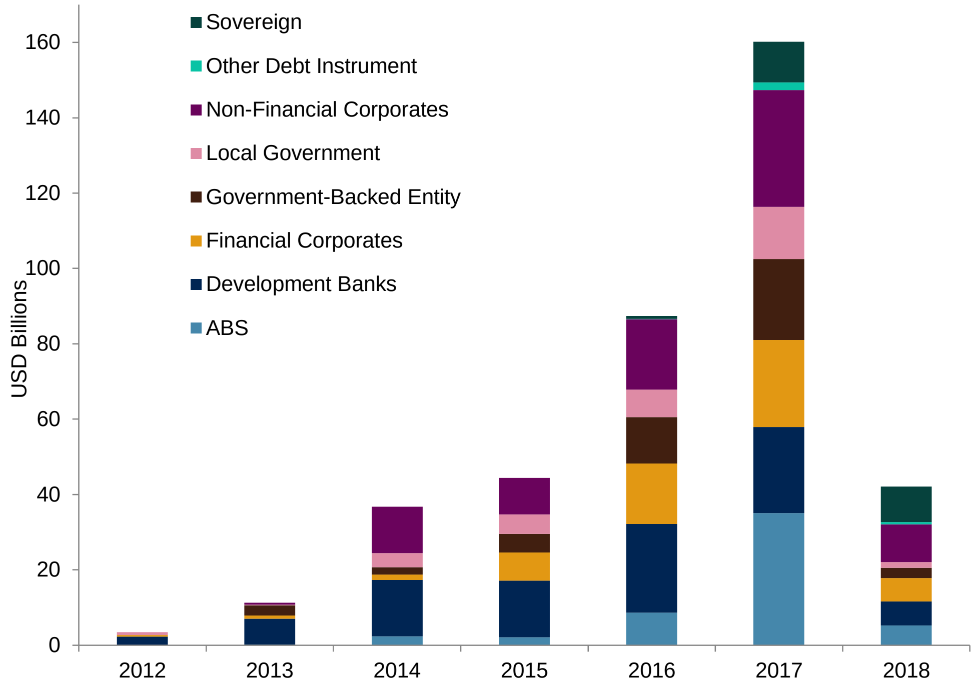
Source: S&P Dow Jones Indices LLC and CBI. Data as of April 30, 2018. Chart is provided for illustrative purposes.

By 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.

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 Region of Ile De France in March 2012. By 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, tapped 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 was 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.

Exhibit 3: Green Bond Annual Gross Issuance



Source: S&P Dow Jones Indices LLC and CBI. Data as of May 9, 2018. Chart is provided for illustrative purposes.

Most recently, sovereign issuers entered the market. The CBI estimates that the trend will persist in 2018.

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 to increase the size of the bond to USD 10.7 billion. By March 2018, Fijian, Nigerian, Belgium, and Indonesian sovereign bonds helped push the category to USD 14 billion. Additionally, Hong Kong has outlined grants for first-time green corporate bond issuers and plans for issuing the largest green sovereign bond in 2018.

The CBI estimates that the trend will persist in 2018, with issuance expected to top USD 250 billion for the year.[5]

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

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

CBI, leveraging their independent, expert-led guidance on which investments are part of a low-carbon economy.

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 April 30, 2018, the S&P Green Bond Select Index accounts for 9% of the bonds by count (305 bonds) and about 69% (USD 216 billion) by market value of the broader S&P Green Bond Index.

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Exhibit 4: Green Bond Market Size

CATEGORY	S&P GREEN BOND INDEX	S&P GREEN BOND SELECT INDEX
Eligible Criteria	CBI Green Flag	Member of the S&P Green Bond Index
Size Criteria	None	Minimum par by Currency (See Methodology for Details)
Liquidity Criteria	None	Issued in Developed or Global Markets
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	3,333	305 (9% of the Bonds in the Benchmark Index)
Market Value (USD Billions)	314.9	216.4 (69% of the Market Value of the Benchmark Index)

Source: S&P Dow Jones Indices LLC. Data as of April 30, 2018. Table is provided for illustrative purposes. See the S&P Green Bond Indices Methodology.

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 or avoidance 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 allocation to them in the portfolio. Lower allocation, if broadly adopted, could pressure companies into adopting positive behavior and reduce risk exposure of the portfolio 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.

Using the second approach is more desirable, as green bonds are able to offer market participants several benefits when viewed through the environmental as well as the diversification lenses.

Using the second approach is more desirable, as green bonds are able to offer market participants several benefits when viewed through the environmental as well as the diversification lenses. The first 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. The second benefit is that the issuer of a green bond is likely positioning itself in a way that reduces risk exposure to future regulatory changes. The 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

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 Bloomberg Barclays Global Aggregate 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.**

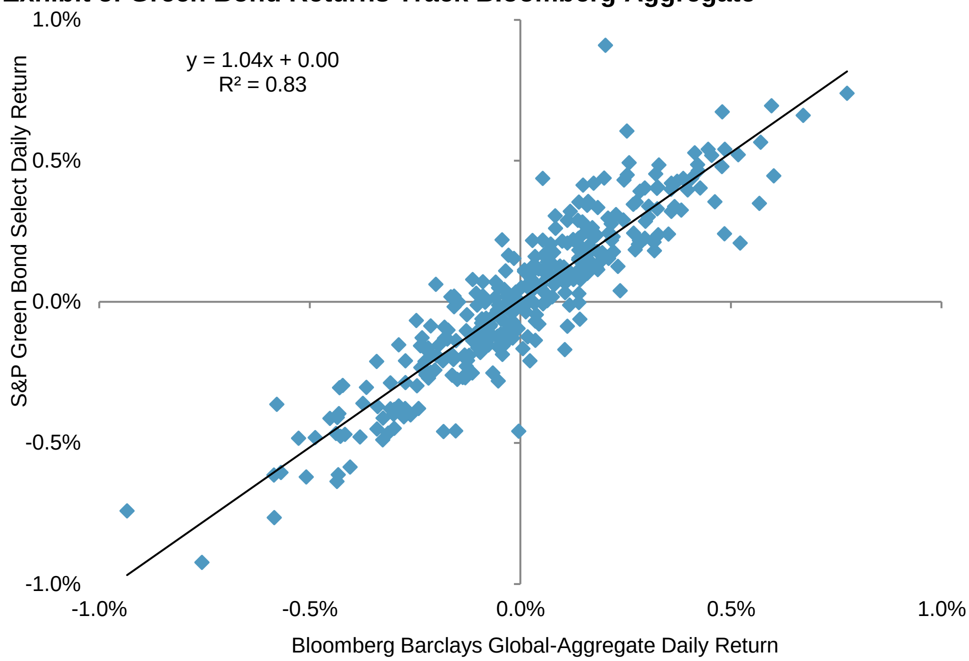
The two indices are relatively similar in terms of characteristics and performance, which means that market participants looking to green-up their portfolio may not need to sacrifice much (and may actually outperform the core). As of April 30, 2018, the two indices were relatively

The S&P Green Bond Select Index has outperformed the Barclays Global Aggregate in U.S. dollar terms.

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 Bloomberg Barclays Global Aggregate Bond Index. In fact, over the same period, the S&P Green Bond Select Index outperformed, returning 3.3% more than the Bloomberg Barclays Global Aggregate Bond Index.[7]

Historical performance of green bonds has been much like the aggregate index. When regressing the daily returns of the S&P Green Bond Select Index against the Bloomberg Barclays Global Aggregate, there was a 0.91 correlation with a statistically significant (at 95%) slope of 1.04 and a small positive alpha (see Exhibit 5). In fact, over the 17-month period ending May 9, 2018, the S&P Green Bond Select Index outperformed the Barclays Global Aggregate in U.S. dollar terms (see Exhibit 6).

Exhibit 5: Green Bond Returns Track Bloomberg Aggregate



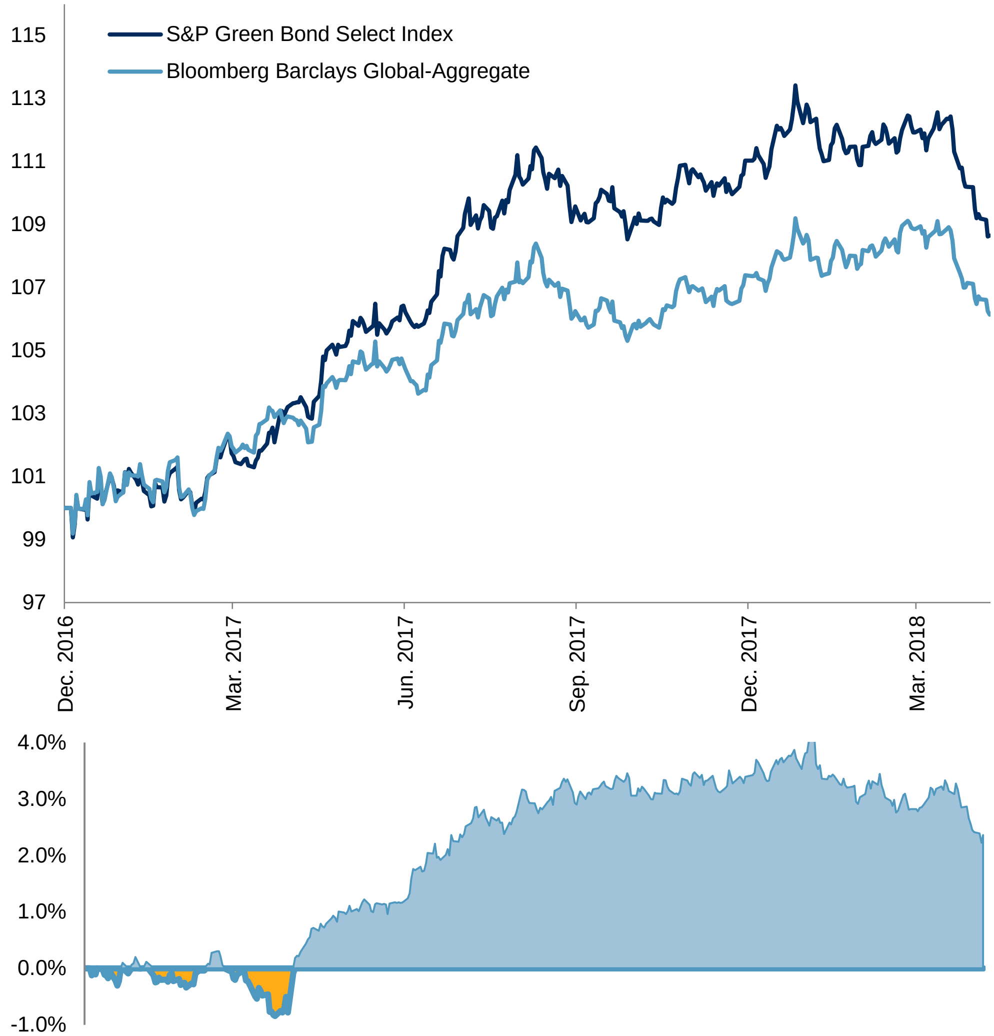
Source: S&P Dow Jones Indices LLC and Bloomberg L.P. Data from Feb. 17, 2017, to May 9, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. The S&P Green Bond Select Index (USD) (TR) is regressed against Bloomberg Barclays Global-Aggregate Total Return Index Value Unhedged USD.

[6] As of April 30, 2018, the modified duration, yield to worst (YTW) and yield to maturity (YTM) for Bloomberg Barclays Global Aggregate Index are 7.06, 1.92 and 1.92. The modified duration, yield to worst (YTW) and yield to maturity (YTM) for S&P Green Bond Select are 6.5, 1.90, and 1.83.

[7] From Feb 17, 2018 through April 30, 2018, the Bloomberg Barclays Global Aggregate Index returned 6.16% while the S&P Green Bond Select Index returned 9.46%. Returns are in USD.

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).

Exhibit 6: S&P Green Bond Select Index (TR) Versus Bloomberg Aggregate



Source: S&P Dow Jones Indices LLC and Bloomberg L.P. Data from Dec. 5, 2016, to May 9, 2018. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflects 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 The Bloomberg Barclays Global-Aggregate Total Return Index Value Unhedged USD were rebased to 100 on Dec. 5, 2016.

The biggest difference between the two indices is in the treasury component. As of May 10, 2018, there were just two central government bonds issued in the green market, and they both qualified for the S&P Green Bond Select Index—a local government bond (treasury) issued by France, which accounted for about 6.2% of the investable index, and a sovereign bond issued by Poland in EUR. In contrast, the treasury and sovereign components of the Bloomberg Barclays Global Aggregate Bond Index totaled 55% (see Exhibit 7).

Corporates, utilities, and commercial banks have accounted for at least one-half of the gross supply over the past two years.

Exhibit 7: Holdings Comparison

ISSUER TYPE	BARCLAYS GLOBAL AGGREGATE (%)	+/- (%)	S&P GREEN BOND SELECT INDEX (%)
Agency	6		33
Supranational	2		17
Utility	1		13
Financial Institutions	7		13
Local Authority	3		9
ABS			-
Sovereign	1		1
CMBS	1		-
Covered	3		2
Industrial	10		6
MBS Passthrough	11		-
Treasury	54		6

Source: S&P Dow Jones Indices LLC and Bloomberg L.P. Data as of May 10, 2018. Past performance is no guarantee of future results. Table is provided for illustrative purposes. Fixed income sectors based on Bloomberg Barclays Level 2 classification.

Looking more closely at the S&P Green Bond Select Index composition, agencies, supranationals, and local authorities represented 59% of the index as of May 2018 (down from 70% in December 2015 and down from 90% in December 2013) (see Exhibit 7). Corporates, utilities, and commercial banks have accounted for at least one-half of the gross supply over the past two years.

The benefits of these differences in sector and issuer exposures is that adding green bonds may also increase the diversification of a global bond allocation. Therefore, market participants that have been looking for a way to diversify their core fixed income away from treasuries may consider green bonds.

Exhibit 8: Index Characteristics

PERIOD	S&P GREEN BOND INDEX	S&P GREEN BOND SELECT INDEX	BLOOMBERG BARCLAYS GLOBAL-AGGREGATE	S&P GREEN BOND INDEX	S&P GREEN BOND SELECT INDEX
	ANNUALIZED RETURN (%, USD)			ANNUALIZED EXCESS RETURN (%)	
1-Year	3.4	2.9	1.6	1.8	1.3
2-Year	7.3	7.6	7.8	-0.2	-0.1
5-Year	0.8	2.0	6.7	-1.1	-0.9
	ANNUALIZED VOLATILITY (%)			TRACKING ERROR (%)	
2-Year	5.0	5.6	5.1	2.2	2.4
5-Year	5.1	5.5	4.9	2.3	2.4
	RISK-ADJUSTED RETURN			INFORMATION RATIO	
2-Year	1.45	1.36	1.53	-0.11	-0.04
5-Year	0.17	0.36	1.37	-0.48	-0.37
	12-MONTH MAX DRAWDOWN (%)			BETA	
5-Year	-11.2	-11.1	-9.1	0.92	1.00

Source: S&P Dow Jones Indices LLC and Bloomberg L.P. Data as of May 9, 2018. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

GREEN BONDS – CONCLUSIONS

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

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).

While there are some differences between the S&P Green Bond Index and the global core in terms of sector and issuer exposures, adding green bonds may provide the additional benefit of increasing the diversification of a global bond allocation.

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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. Complete index methodology details are available at www.spdji.com.

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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. 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.

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