Kunming-Montreal agreements: A bond perspective

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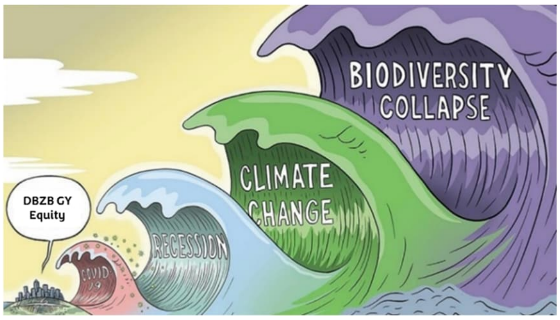

Biodiversity exposures in investment portfolios are becoming increasingly important also across the fixed income space.[1] In this context, we analyse the potential of government bond portfolios aligning with the Kunming-Montreal (KM) Global Biodiversity Framework (GBF).

The Global Biodiversity Framework – adopted in December 2022 – includes four goals and twenty-three targets to be reached by 2030 addressing biodiversity loss and natural ecosystems restoration. The landmark goal of this agreement is the "30x30" target that aims to protect 30% of the world's land, inland water, coastal areas and oceans by 2030.

Flow: KM GBF has the potential to attain the same investment relevance as the 2015 Paris Agreement that acted as a wake-up call for the financial community to start aligning portfolios and investments with a 1.5-2°C target.[2] Similarly, it would be strategic for portfolios to pre-position for such secular trends associated with biodiversity commitments and targets.

Credit risk: Biodiversity has robustly documented correlations with credit risk.[3] In the context of sovereign bonds, it is estimated that many countries including the USA and Canada could be facing credit downgrades due to biodiversity loss.[4] Research also indicates that "*by better protecting their natural assets, countries could see their creditworthiness improve.*"[5]

How will the flow trend and credit risk arguments drive portfolio re-allocations in light of the KM framework? We analyse one of the largest global DM ETFs, the *Xtrackers II Global Government Bond UCITS ETF* ("DBZB"), as an indicator of how government bond portfolios can align with the GBF's target of protecting 30% of world's land by 2030.

The ETF's current level of protected land, averaging at 21%, falls short of the GBF's target. Whilst a 30% figure may appear readily achievable, the portfolio's significant exposure to the US - a country with a comparatively low percentage of protected areas – may hinder its realisation. Immediate alignment is therefore unrealistic from a traditional government bond portfolio management perspective as US Treasuries would be very underweighted.

As an alternative, we propose adjusting portfolio weights using utility functions, to bridge the gap between the present and the anticipated future. This will require investors finding a compromise between GBF alignment and active risk. The need for such trade-offs may decrease over time as countries enhance their biodiversity conservation efforts.

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[1] "Biodiversity quickly rises up the ESG investing agenda", FT, 20 Sept 2022.
[2] See "PAB ETFs: A performance and climate alignment review", AFII, 9 Feb 2023.
[3] "The Market Effect of Acute Biodiversity Risk: the Case of Corporate Bonds", Working Paper 136-2022, Amundi, 30 Nov 2022.
[4] "How biodiversity loss could cause bankruptcy in some countries", World Economic Forum, 25 July 2022.
[5] "Nature Loss & Sovereign Credit Ratings", Bennett Institute for Public Policy, 22 June 2022.

The Kunming-Montreal agreement: An overview

The Kunming-Montreal Global Biodiversity Framework ("GBF") is a landmark deal agreed to by almost 200 signatories following discussions at COP15 in December 2022. The framework contains 23 targets setting out the actions which need to be initiated and completed by 2030 in order to achieve four long-term outcome-oriented goals for 2050.

The final deal includes the headline 30x30 target of ensuring that by 2030, at least 30% of terrestrial, inland water, and of coastal and marine areas are effectively conserved and managed. Other targets aim to limit the risks faced by biodiversity, to meet the needs of populations in sustainable and benefit-sharing ways, and finally to provide appropriate solutions for implementing these plans and integrating biodiversity into policy, regulation, planning, and development processes. Protecting nature and biodiversity is not just an ethical or moral consideration – it is also financially prudent. Ecosystem services are worth an estimated US$ 125-140 trillion a year such as through pollination and flood protection.[6]

Some consider the GBF a "Paris moment for nature", representing a step forward in ambition, whilst others contend this terminology, and lament the lack of urgency shown.[7]

There are already signs of life in the biodiversity investment space, with 14 funds representing US$ 1.6 billion of fund assets explicitly targetting biodiversity and natural capital; however, this pales in comparison to the US$ 350 billion in assets represented by over 1,100 climate funds, according to Morningstar.[8]

As part of the framework, countries will need to produce national biodiversity action plans aligned with the goals and targets of the GBF. The 30x30 target in particular provides a clear metric against which the biodiversity policy progress of different sovereigns can be measured and also appears to be a means of engagement with sovereigns around the theme of nature protection.

Financial materiality for government bond investors

"Humanity is embedded in nature, entirely dependent on it for survival, wellbeing, and economic prosperity", to quote the 2021 Dasgupta report.[9] The report estimates that between 1992 and 2014, human capital per capita increased by 13% but nature capital per capita decreased by around 40%. It is estimated that US$44 trillion of global added value generation (around half of the world's GDP) is moderately or highly dependent on natural assets and ecosystem services.[10]

A 2021 report from the World Bank estimates that a collapse in ecosystem services could result in a 2.3% decline of global GDP annually by 2030.[11] Whilst sub-Saharan and Souh Asian countries will be affected the hardest in percentage terms, the United States and the European Union could experience significant GDP loss in monetary terms.

Consequences for government bond investors may be dramatic. Studies suggest that countries may be hit by severe credit downgrades – up to six notches for countries such as Malaysia and China – due to partial nature collapse and subsequent effects on ecosystems services such as fisheries, tropical timber, and wild pollination services to name but a few. It is estimated that credit downgrades could cost to up to US$ 53 billion in additional annual interest costs.[12]

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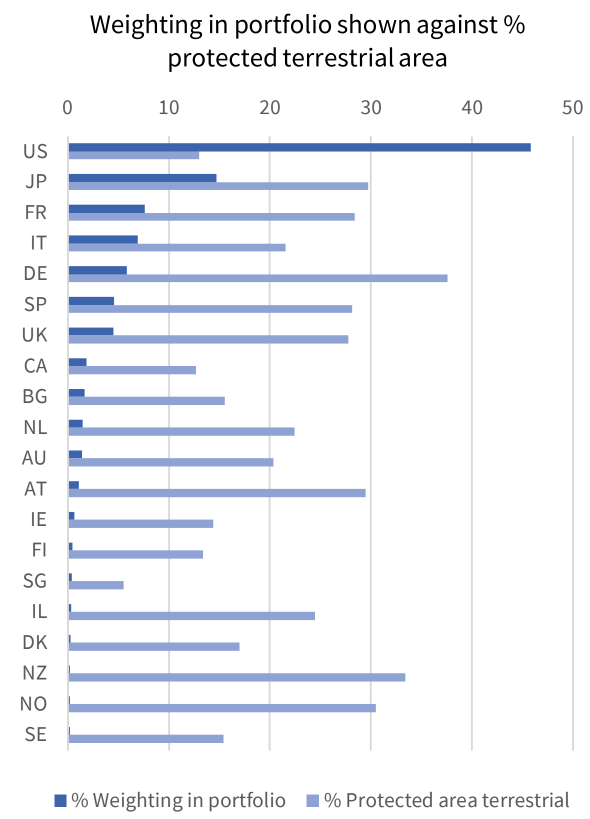
[6] "Biodiversity: Finance and the Economic and Business Case for Action", OECD, 6 Dec 2019.
[7] "What's happening at COP15? Our updates from the conference", Client Earth, 2022.
[8] "COP15: A Turning Point for Investor Approaches to Biodiversity", Morningstar, 2022
[9] "The Economics of Biodiversity: The Dasgupta Review", HM Treasury, 20 Aug 2021.
[10] "Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy", World Economic Forum, Jan 2020.
[11] "The Economic Case for Nature", World Bank, June 2021
[12] "Nature Loss and Sovereign Credit Ratings", Finance For Biodiversity, Sept 2022.

Such market implications will inevitably lead to substantial capital flows towards countries less exposed to biodiversity loss risk. There are several ways for investors to act upon biodiversity and nature loss, either by re-allocating their capital and/or by engaging with investees. Although sovereign engagement may be a challenging exercise for investment managers,[13] they can initiate dialogues around issues they deem material and raise market awareness,[14] justifying the need for biodiversity-mindful investors to align their investments with frameworks such as the GBF. Instances of investment managers contribution to sovereign engagement also include collaborative actions such as PRI's "Collaborative Sovereign Engagement on Climate Change" or through widely recognised frameworks like the "Transition Pathway Initative" amongst others.[15]

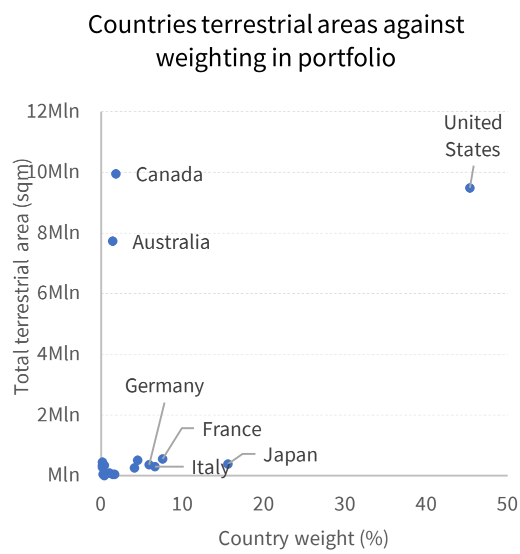
Measuring funds' alignment with the 30x30 target

Although the GBF's 30x30 target encompasses both terrestrial and marine ecosystems, this analysis primarily focuses on the goal of protecting 30% of world's land by 2030 ("the GBF's target"). Nonetheless, the approach outlined below can be readily adapted for marine ecosystems. Being mindful of the variety in investment approaches, we chose to illustrate our findings with one of the largest government bonds ETFs, the *Xtrackers II Global Government Bond UCITS ETF (DBZB).*[16] The ETF provides a diversified exposure to global DM government bonds. Currently, it prices with an average yield of 3.05% and a duration of 7.65.

Figure 1. ETF characteristics: weights, land size and protected areas as of 31 Jan 2023. Source: Bloomberg, Protected Planet, AFII. Two letter ISO codes available in Table 1.



	Terrestrial area (km^2)	% of total Earth terrestrial area
Portfolio protected	5 114 612	3.45%
Total portfolio	31 170 615	21.01%
Total Earth	148 326 000	



[13] "Sovereign engagement: the next frontier for fixed-income investors?", 17 Aug 2022.
[14] See as an example "Nordea Asset Management suspends Brazilian government bond purchases due to Amazon fires", Reuters, 30 Aug 2019.
[15] "ESG: Engaging with sovereigns", IPE, Jan 2021.
[16] For further details on the fund, see the fund's KID.

As illustrated in Figure 1, US bonds account for almost half of the ETF's allocation, with Japan coming second at 15.64%. Out of all the countries in scope, only Germany, New Zealand and Norway stand out for protecting above 30% of their terrestrial area in line with the GBF, whilst Singapore, Canada and the US are less than halfway to the target.

It is still unclear whether the GBF's target will be implemented at a global or country level. In the context of this analysis, we make the assumption that the portfolio's exposure to protected areas (the "WAPL" – Weighted Average Protected Land) is equal to the weighted average of each country's percentage of protected area:

$$WAPL = \sum_{i=1}^{n} \omega_i \times \%PL_i$$

where ω_i is the countries' weight and $\%PL_i$ countries' percentage of protected terrestrial areas.

For the DBZB ETF, the weighted average protected area percentage (WAPL) of **21%**, a figure clearly lower than the GBF's target of 30%. DBZB's investors have exposure to twenty countries that altogether represent almost a quarter of the Earth's total area and a wide range of ecosystems. United States and Australia both qualify as "megadiverse countries" for their remarkable abundance of endemic species, diverse biomes and unique habitats.[17]

Portfolio rebalancing for improving alignment with the GBF's target

Can investors reach the Kunming-Montreal goal of achieving a 30% WAPL while reasonably matching the risk and return profiles of the original index/ETF? In this section, we analyse how investors can enhance their government bond portfolios' biodiversity footprint and align more closely to the GBF's target.

A possible way to resolve this problem is by seeking out "optimal portfolios" that maximise WAPL and match predetermined tracking error and country weight objectives.[18] To simplify the optimisation process, we do not seek to find optimal weights for each security in DBZB's portfolio but rather create a "proxy" portfolio composed of twenty sovereign bonds indices (one for each country the ETF is exposed to) as defined in Table 1. We subsequently create a synthetic portfolio (the "parent portfolio") using the DBZB's country weights for each country index in order to compare more accurately optimised portfolios. With an average duration of 7.07 and an average yield of 3.70%, the synthetic portfolio characteristics slightly differ from the original portfolio, but that should not significantly impact outcomes of our analysis as both portfolios appear highly correlated and have the same country exposures.

[17] "Megadiverse Countries", UNEP WCMC biodiversity a-z, 24 Dec 2020.

[18] For an overview of portfolio optimisation techniques, see e.g. "Optimization Methods in Finance", Carnegie Mellon University, Jan 2006, and for more details on limitations and implementation differences that may result in diverging outcomes, see "Computational Challenged in Portfolio Management", MIT Sloan School of Management and Operations Research Center, June 2015.

Table 1. Portfolio optimisation underlying indices as of 13 March 2023. Sources: Bloomberg, AFII.

Country	ISO code	Bloomberg index ticker	Average duration	Average yield (%)	10Y volatility
United States	US	I03389US Index	6.58	4.63	5.0%
Japan	JP	I03378US Index	9.15	0.70	11.3%
France	FR	I03359US Index	6.81	3.48	10.1%
Italy	IT	I03364US Index	6.31	4.01	11.7%
Germany	DE	I03360US Index	6.37	3.27	9.4%
Spain	SP	I03371US Index	6.39	3.55	10.6%
United Kingdom	UK	I03374US Index	8.54	4.24	12.5%
Canada	CA	I03385US Index	7.01	4.09	8.7%
Belgium	BG	I03353US Index	8.50	3.46	10.9%
Netherlands	NL	I03366US Index	6.98	3.57	9.2%
Australia	AU	I03375US Index	5.70	4.05	10.1%
Austria	AT	I03352US Index	7.43	3.31	10.6%
Ireland	IE	I03363US Index	6.96	3.80	9.8%
Finland	FI	I03358US Index	6.00	3.47	9.4%
Singapore	SG	I03382US Index	6.94	3.80	6.6%
Israel	IL	I03395US Index	7.86	4.43	8.1%
Denmark	DK	I03357US Index	5.58	3.58	9.7%
New Zealand	NZ	I03380US Index	5.15	4.73	11.0%
Norway	NO	I03367US Index	4.81	3.95	8.4%
Sweden	SE	I03372US Index	3.92	3.88	9.4%

a. Unconstrained portfolio

In the first instance, an "unconstrained" portfolio aligned with the GBF's target (i.e. a WAPL of 30%) is built. This portfolio is not subject to any country weight or tracking error restrictions. The primary objective of the optimisation process is to identify a portfolio that achieves the desired 30% WAPL while deviating minimally from the parent portfolio. Hence, the optimisation process aims to solve the following problem:

$$\underset{\omega_{opt}}{argmin} \sqrt{\frac{1}{N} \times \sum_{i=1}^{N} \left(\omega_p^i - \omega_{opt}^i\right)^2}$$

Subject to:

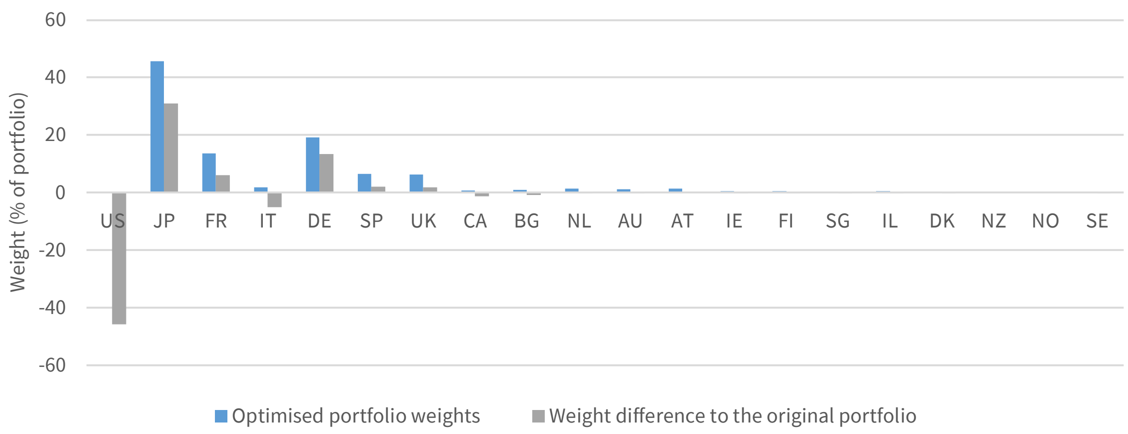
$$\begin{cases} WAPL = \sum_{i=1}^{N} \omega_{opt}^i \times \%PL_i = 0.3 \\ \sum_{i=1}^{N} \omega_{opt}^i = 1 \\ \omega_{opt}^i \geq 0, \qquad for\ i = 1, \ldots, N \end{cases}$$

With:

- ω_{opt}^i the optimised portfolio's weights,
- ω_p^i the parent portfolio's weights
- N the number of portfolio's constituents

Under this approach, we find an optimal portfolio with no exposure to the US and overweighted in Japanese and German bonds by respectively 31% and 13% as shown in Figure 2. However, the increased allocation to Japanese bonds has resulted in a reduction of the portfolio's average yield by approximately one third, bringing it down to 2.25%. Moreover, the duration of the portfolio has considerably increased to 7.86, an unwelcome outcome in a context of rising interest rates. Additionally, the high portfolio concentration and substantial active risk compared to the parent portfolio make this solution non-investable. Hence, the next step is to find a solution that maximises the WAPL while adhering to active risk constraints.

Figure 2. Unconstrained portfolio weights and active risk compared to the parent portfolio as of 31 Jan 2023. Sources: AFII, Bloomberg.



b. Optimal portfolio under tracking error constraints

Since there are no investable solutions aligned with the GBF, the next logical step is to identify a portfolio that maximises its WAPL while minimising its tracking error (TE) against the parent portfolio. However, tracking error is solely based on underlying's historical performance, and if left unchecked, the optimisation process may result in a highly concentrated portfolio. To prevent this, we also set an additional constraint on the optimised weight relative to the parent portfolio, limiting it to a range of +/- 50% (in relative terms). The optimisation process therefore aims at finding the solution to the below problem:

$$\underset{\omega_{opt}}{argmax} \sum_{i=1}^{N} \omega_{opt}^{i} \times \%PL_i \quad \& \quad \underset{\omega_{opt}}{argmin} \sqrt{\frac{1}{n-1} \times \sum_{i=1}^{n} \left(R_p^i - R_{opt}^i\right)^2}$$

Subject to:

$$\begin{cases} \omega_{opt}^{i} \geq 0, \quad for\ i = 1, \dots, N \\ \displaystyle\sum_{i=1}^{N} \omega_{opt}^{i} = 1 \\ \left| \dfrac{\omega_{opt}^{i}}{\omega_{p}^{i}} - 1 \right| \leq 0.5, \quad for\ i = 1, \dots, N \end{cases}$$

With:

-R_p^i, the parent's portfolio returns on date i.

- R_{opt}^i the optimised portfolio returns on date i.

This problem can be simplified by defining a utility function $U(\emptyset)$ such as $U(\emptyset) = WAPL - \emptyset * TE^2$, with:

- $\emptyset$ a constant. We set this parameter at 100 in order to account for the difference of magnitude between WAPL and TE. A lower figure would inevitably result in a near-linear utility function.
- $WAPL = \sum_{i=1}^{N} \omega_{opt}^{i} \times \%PL_i$
- $TE = \sqrt{\frac{1}{n-1} \times \sum_{i=1}^{n} \left(R_p^i - R_{opt}^i\right)^2}$

Therefore, the optimisation problem can be reduced to a simpler expression:

$$\underset{\omega_{opt}}{argmax} \sum_{i=1}^{N} WAPL - \emptyset * TE^2$$

Subject to:

$$\begin{cases} \omega_{opt}^{i} \geq 0, \quad for\ i = 1, \ldots, N \\ \sum_{i=1}^{N} \omega_{opt}^{i} = 1 \end{cases}$$

As illustrated in Figure 3, we find that the portfolio yielding the maximum expected utility has a WAPL of 22.5%. The optimal portfolio is underweighting US securities by half as shown in Figure 4 but doubles the allocation to Japanese, French and German bonds. Considering the substantial active risk taken by investors, the WAPL improvement over the parent portfolio appears marginal.

Figure 3. WAPL as a function of the portfolio's tracking error and associated utility function. Source: AFII.

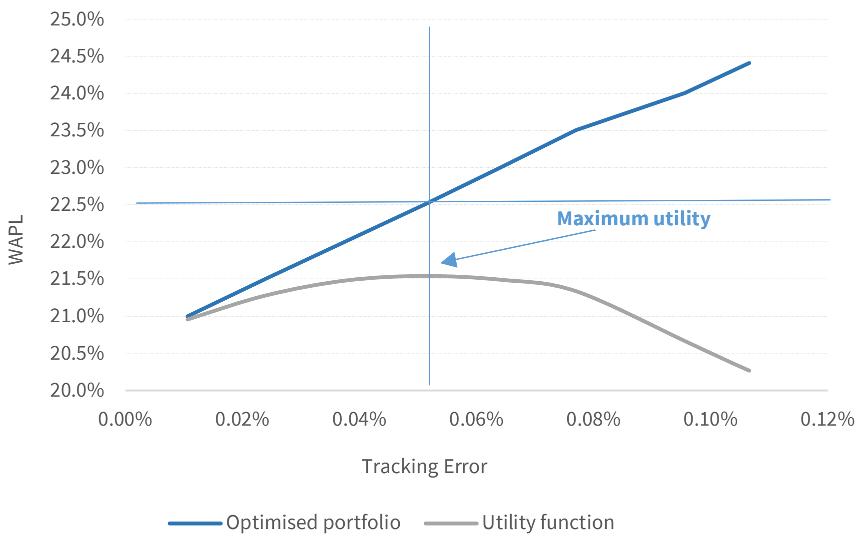
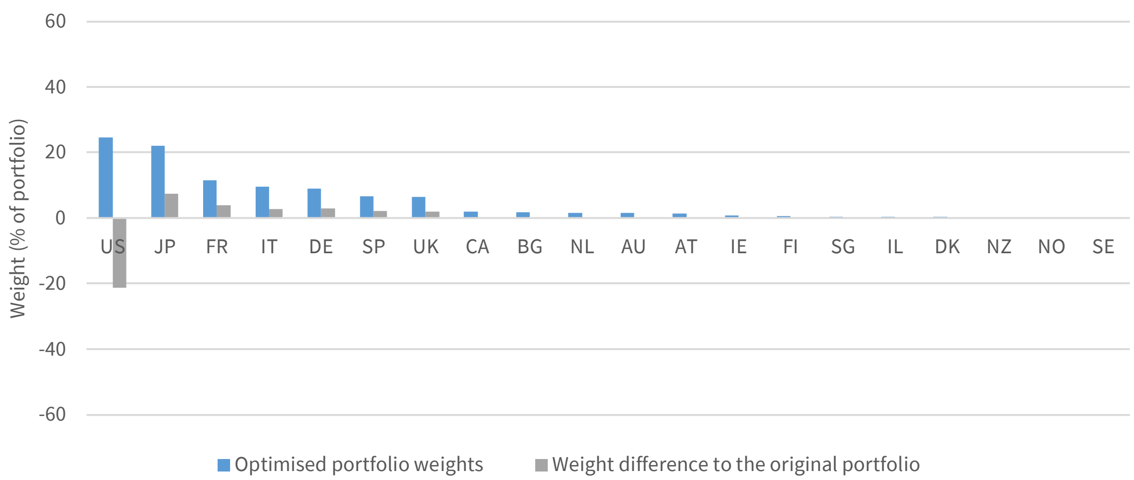


Figure 4. Optimised, constrained (no more than 50% change in weight versus original portfolio) portfolio weights and active risk compared to the parent portfolio. Sources: AFII. Bloomberg.



In a context of portfolio reallocation on the back of biodiversity concerns, Japan, France and Germany seem best placed for attracting substantial flows especially when compared to countries such as the US or Canada. This observation serves as a critical takeaway from our analysis: **alignment of global government bond portfolio with the GBF requires significant underweighting of US securities, a challenging exercise considering the country's yield contribution to the portfolio and relatively low volatility.**

c. Constrained portfolio with no change of US allocation

Considering investors' aversion to substantially reducing US allocation, we build in this section a portfolio that maximises the WAPL while keeping the allocation to the US unchanged. Thus, the optimisation problem can be written in the following form:

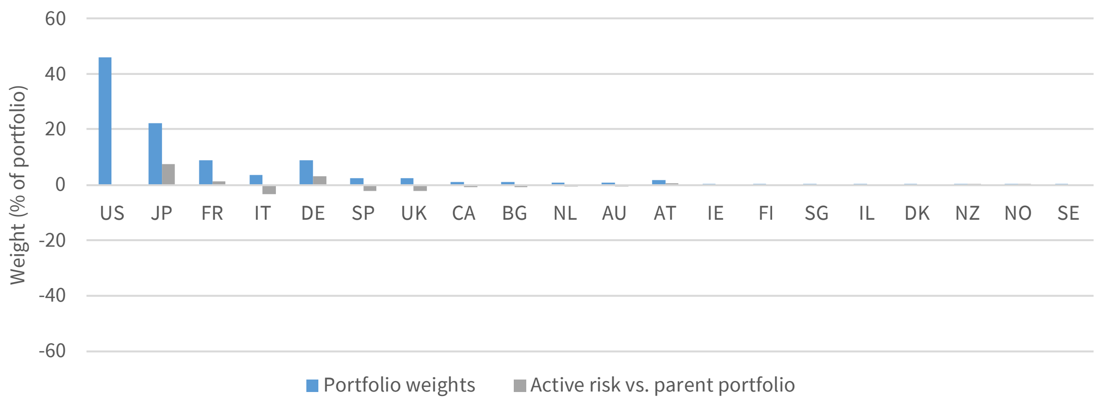
$$\underset{\omega_{opt}}{argmax} \sum_{i=1}^{N} \omega_{opt}^{i} \times \%PL_i$$

Subject to:

$$\begin{cases} \omega_{opt}^{i} \geq 0, \quad for\ i = 1, \ldots, N \\ \sum_{i=1}^{N} \omega_{opt}^{i} = 1 \\ \left| \frac{\omega_{opt}^{i}}{\omega_{p}^{i}} - 1 \right| \leq 0.5, \quad for\ i = 2, \ldots, N \\ \omega_{opt}^{1} = \omega_{p}^{1} \end{cases}$$

The optimisation process finds a portfolio with a WAPL of 21.73%, a modest improvement over the parent portfolio. Under this solution, Japanese and German bonds are considerably overweighted while Italy, Spain and UK weights are halved as presented in Figure 5. Unsurprisingly, with an average duration and yield of 7.20 and 3.43% respectively, the portfolio is closely matching risk and return characteristics of the parent portfolio.

Figure 5. Optimised portfolio under US weight constraint (making no change to UST allocation). Source: AFII, Bloomberg.



The substantial allocation in US securities presents two challenges: achieving the GBF's target and meeting investors' financial objectives. The country has a low figure for protected areas (13.02s%), hindering efforts to align with the GBF's target. We have evaluated that if the US alone doubled their proportion of protected land, the portfolio's WAPL would move closer to the coveted 30% without substantial portfolio re-allocation.

Additionally, investors with such a portfolio face significant underperformance risks if the US does not ramp up its biodiversity strategy. A recent report from the University of Cambridge evaluates that the US credit rating could be lowered by half a notch under a scenario of partial nature collapse.[19] There are unfortunately uncertainties around the US meeting the GBF's targets. The Convention on Biological Diversity (CBD) excludes the United States, owing to the difficulty of ratifying international treaties in the Senate, where such deals require a two-thirds majority to pass. Despite this, the United States is committed to the ambition of protecting 30% of land and waters by 2030, as part of its 'America the Beautiful' initiative.[20]

Conclusion

Repositioning portfolios to comply with the GBF's framework could result in substantial flows to countries with strongest national biodiversity strategies and as with the Paris Agreement, investors shifting their portfolios ahead of a market trend may yield better returns considering the financial materiality of biodiversity loss.[21] It is therefore key for investors to implement monitoring and reporting of their government bond portfolios' adherence to the GBF's targets.

Global DM portfolios heavily allocated in US Treasuries – a country substantially falling short of the GBF's 30x30 terrestrial targets – may face significant challenges. To transition a portfolio toward the 30x30 regime requires a trade-off between alignment strength and US active risk. As it appears unrealistic for investment managers to drastically reduce their allocation to the US, we propose that investors ramp up their engagement with the country, at the very least. If the US significantly increases its proportion of protected areas, we can expect portfolios' alignment to grow accordingly, resulting in lower divergence from parent portfolios.

Investors can take a pro-active approach by integrating both spot and forward-looking measures of countries biodiversity and natural capital assets protection in their allocation process. The growing sovereign SLB market[22,23] provides an opportunity for increasing inclusion of biodiversity metrics in the sovereign fixed income space and a platform for investors to step-up their biodiversity engagement.

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[19] "Nature Loss & Sovereign Credit Ratings", Bennett Institute for Public Policy, 22 June 2022.
[20] "America The Beautiful" U.S. Department of the Interior.
[21] It has been shown that historically, climate alignment does not come at a cost so we can expect the same phenomenon with biodiversity. For further details, see "Decarbonising iShares' LQD ETF", AFII, 15 Dec 2022.
[22] "More sovereign SLBs 'on the way' after landmark Uruguay deal", Responsible Investor, 24 Oct 2022.
[23] For a detailed case study, see "Chile sustainability-linked bond: Optionality analysis", AFII, 5 April 2022.

Appendix – Protected Planet methodology

Protected Planet uses data from The World Database on Protected Areas (WDPA),[24] a comprehensive global database of marine and terrestrial protected areas. It is updated on a monthly basis and managed by the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) in collaboration with governments, non-governmental organisations, academia and industry.

The WDPA uses the definitions of both the CBD as well as the International Union for Conservation of Nature (IUCN) in defining protected areas,[25] which have been agreed to have the same meaning. The IUCN defines a protected area as "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values".[26]

Data from the WDPA were used for reporting on progress towards reaching the Aichi Biodiversity Targets, as well as the 2030 SDGs. A Protected Planet report is released every two years by the UNEP-WCMC, indicating the status of the world's protected areas, as well as giving recommendations. The wording of Aichi target 11 ("By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.") is directly aligned with the wording of the Kunming-Montreal agreement, which also considers "terrestrial, inland water, and coastal and marine areas", highlighting the suitability of this dataset to AFII's work.

[24] "Protected Areas (WDPA) Methodology", Protected Planet.
[25] "User Manual for the World Database on Protected Areas", UNEP-WCMC 2019.
[26] "Guidelines for Applying Protected Area Management Categories." Dudley, 2008.

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