

States, transitions, probabilities

10th Annual Conference of the Principles, ICMA, Amsterdam, 25 June 2024
[Dr. Ulf Erlandsson, Anthropocene Fixed Income Institute \(AFII\)](#)

About the Anthropocene Fixed Income Institute

Empower fixed income markets to drive the global climate transition at speed and scale.

- **AFII is a non-profit institute that provides fixed income investors with the insights and tools they need to align their portfolios with ambitious climate and biodiversity targets.**
- AFII takes a market-based approach, offering practitioners cutting-edge and forward-thinking research and technical advisory support that will lead to positive portfolio strategies and trade opportunities.
- **We call this “shifting future climate capital.”**
- The AFII team has a strong background in fixed income research and product development, and in climate science and sustainable finance.
- Launched in 2020, AFII is funded by markets-focused climate philanthropists: Growald Climate Foundation (Rockefellers, US), Generation IM Foundation, Laudes Foundation and Quadrature Climate Foundation (UK).

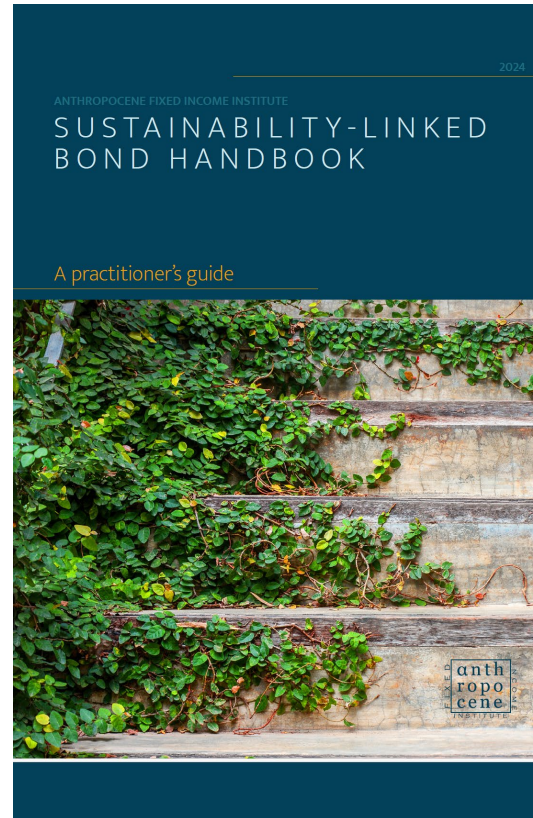


The Sustainability-Linked Bond Handbook

Published in May, 2024, the Handbook is the first comprehensive piece on the SLB instrument from a practical as well as theoretical perspective.

It mixes pricing models with 44 case studies of executed SLB transaction.

At the core of the book is the valuation of SLBs as options, that can driver lower cost-of-capital for the issuer, and provides a fiduciary duty aligned position for investors.



SUSTAINABILITY-LINKED BOND HANDBOOK

A practitioner's guide

Ulf Erlandsson and Josephine Richardson
with Stephanie Mielnik, Kamesh Korangi and Cedric Rimaud

1st EDITION 2024

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JOSEPHINE RICHARDSON MANAGING DIRECTOR, HEAD OF RESEARCH, ANTHROPOCENE FIXED INCOME INSTITUTE

ULF ERLANDSSON is a pioneer of climate-focused fixed income portfolio management. His award-winning 2017 paper, "Credit alpha and CO₂ reduction: A portfolio manager approach", introduced the concept of climate trading as he headed credit and SSAs at pension fund AP4. Earlier, as a quant strategist at Barclays Capital, he co-authored three books on macro- and technical credit trading and developed the market's first high-frequency CDS index trading strategy.

In 2020, Ulf founded the Anthropocene Fixed Income Institute to devise and advocate for practical strategies to drive climate positive capital flows in the fixed income markets. The institute has quickly become a thought leader in the credit space on climate and nature loss. Ulf was awarded Bond Personality of the Year 2022 by Environmental Finance in recognition of the institute's impact.

Ulf received his Ph.D. in Economics from Lund University with his thesis focused on transition probabilities in regime switching models.

JO RICHARDSON worked in fixed income markets at JP Morgan for 18 years. She has extensive experience trading structured, flow and index credit products, and in the modelling and valuation of derivatives.

At the Anthropocene Fixed Income Institute, Jo's research focus is pricing and risk management of climate risk. She works to identify unpriced externalities, and analyse potential triggers for valuation shifts. She is an expert on Sustainability-Linked Bonds, their structures, pricing and impact. She is a regular panellist at events, discussing market developments, and supporting investors to unlock the value of the product.

Jo completed her undergraduate degree in Pure and Applied Mathematics at the University of Cambridge, before completing the Management Studies Tripos at the Judge Business School. She is a fellow of the Chartered Institute of Management Accountants, and has a strong interest in emissions accounting and disclosure.

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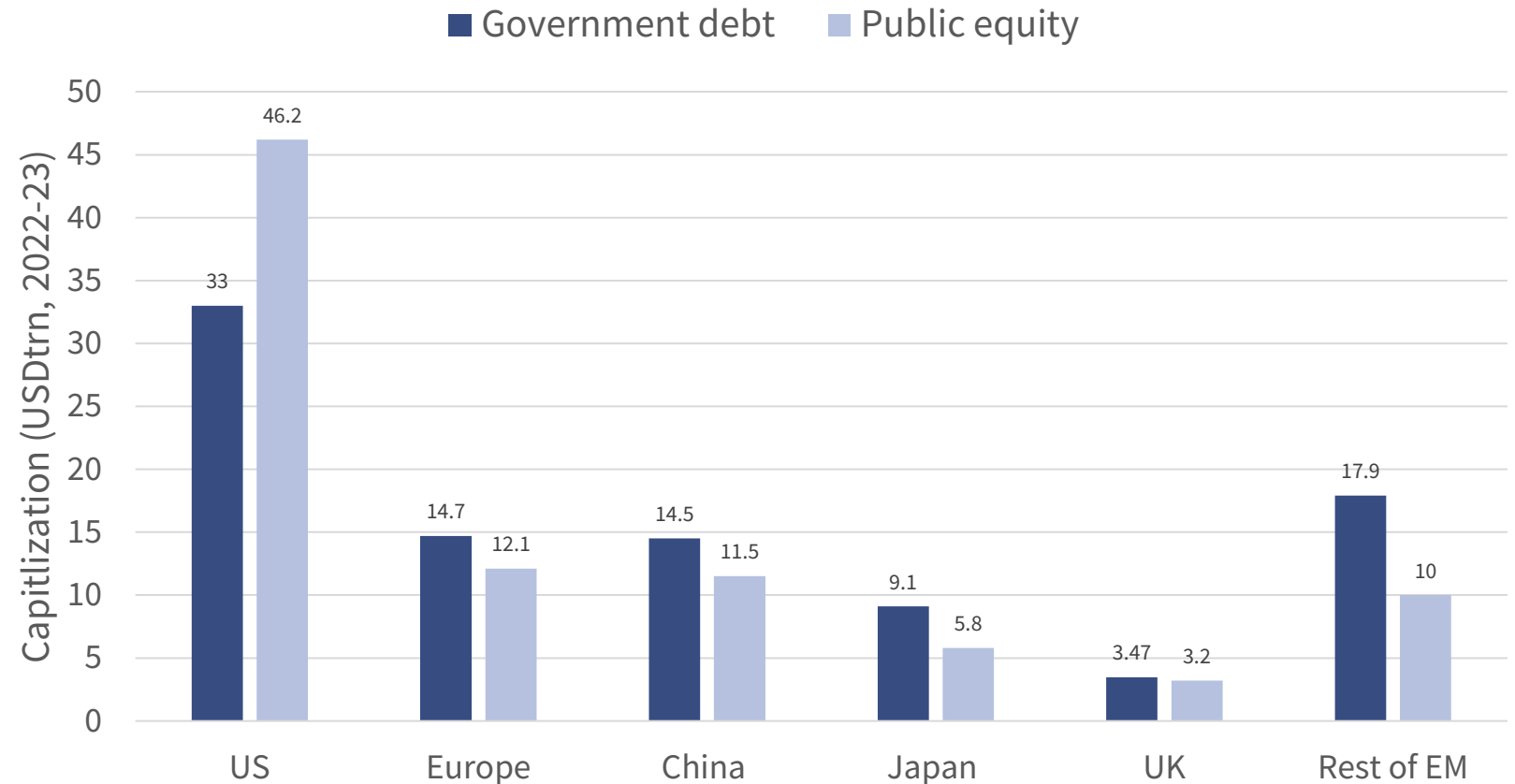
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<https://anthropocenefii.org/resources/sustainability-linked-bond-handbook>

Potential impact of government (bond) transition

AT USD92TRN, GOVERNMENT DEBT EXCEEDS PUBLIC MARKET EQUITY CAP

- Sovereign debt/government bonds as pools of capital are similar in size to all publicly traded equity.
- SOEs and NOCs play a very substantial role in global carbon emission mitigation.

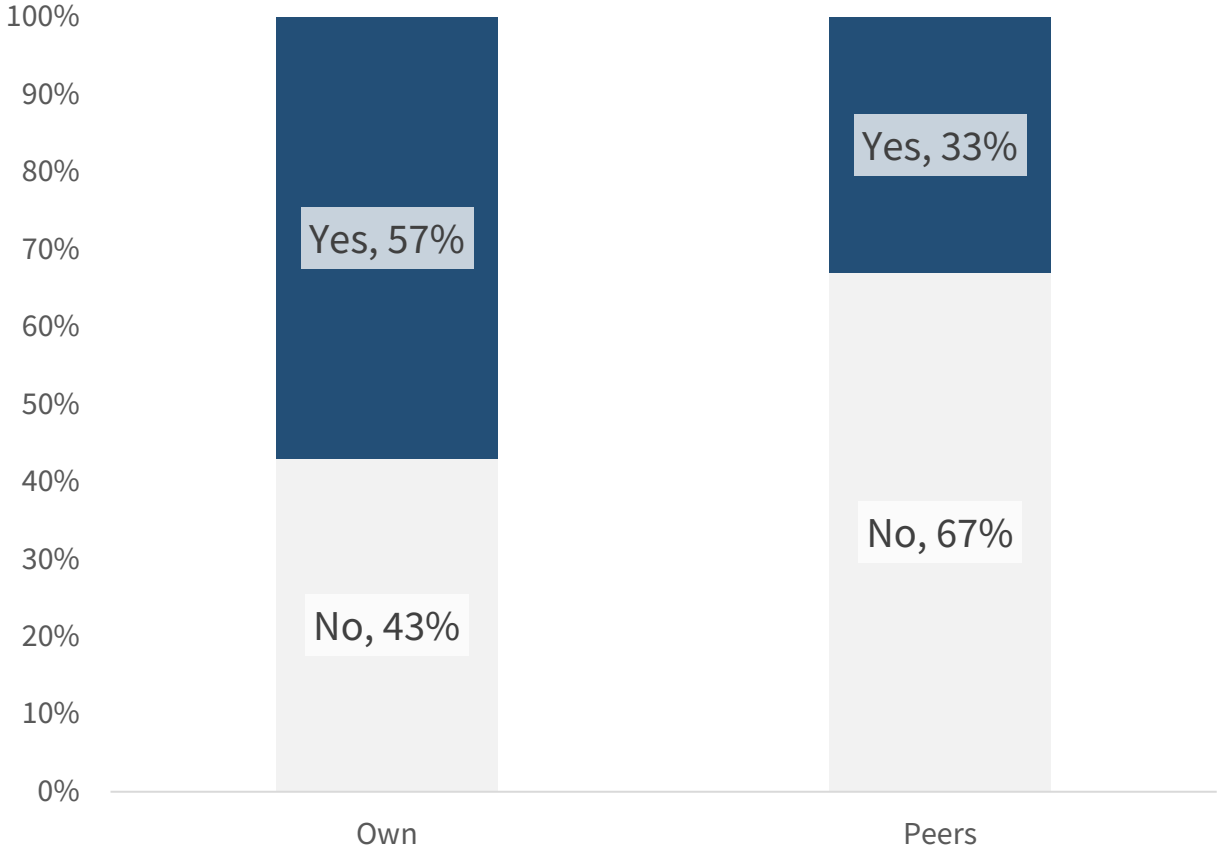


We all plan for net-zero, but will all succeed?

THERE ARE SUBSTANTIAL HETEROGENEITY IF ISSUERS WILL HIT THEIR DECARBONISATION TARGETS OR NOT

Survey question:
“Will you/will your peers hit net-zero targets?”

Sample of 250 large-cap corporates.
Source: Bloomberg Intelligence.

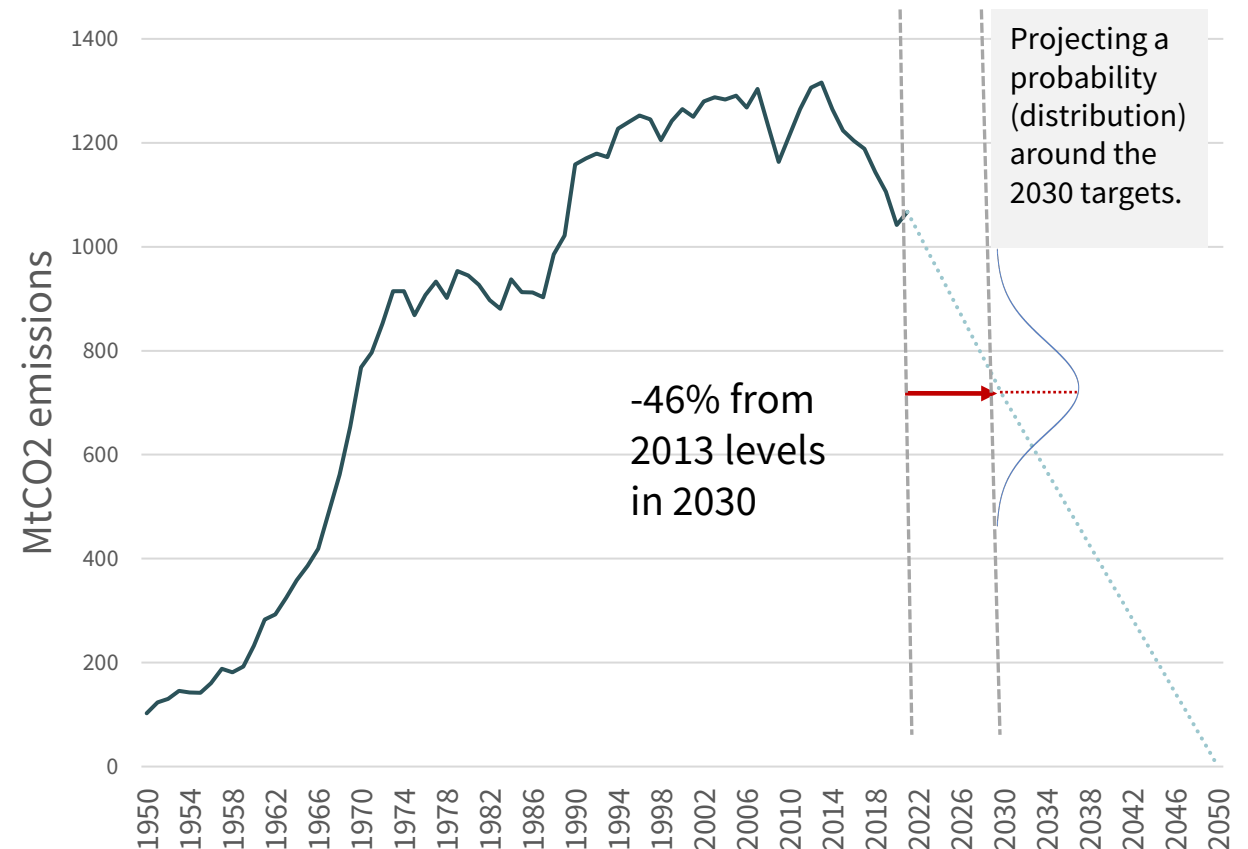


Sovereign transition: a probabilistic perspective

TARGETS ARE TARGETS BUT INVESTORS NEED TO ASSESS PROBABILITY AS WELL AS AMBITIOUSNESS

For investors, rapid decarbonization needs both ambitious, science-based transition plans, as well as headroom/hedges for the unexpected.

Sample sovereign emission trajectory and NDC targets.

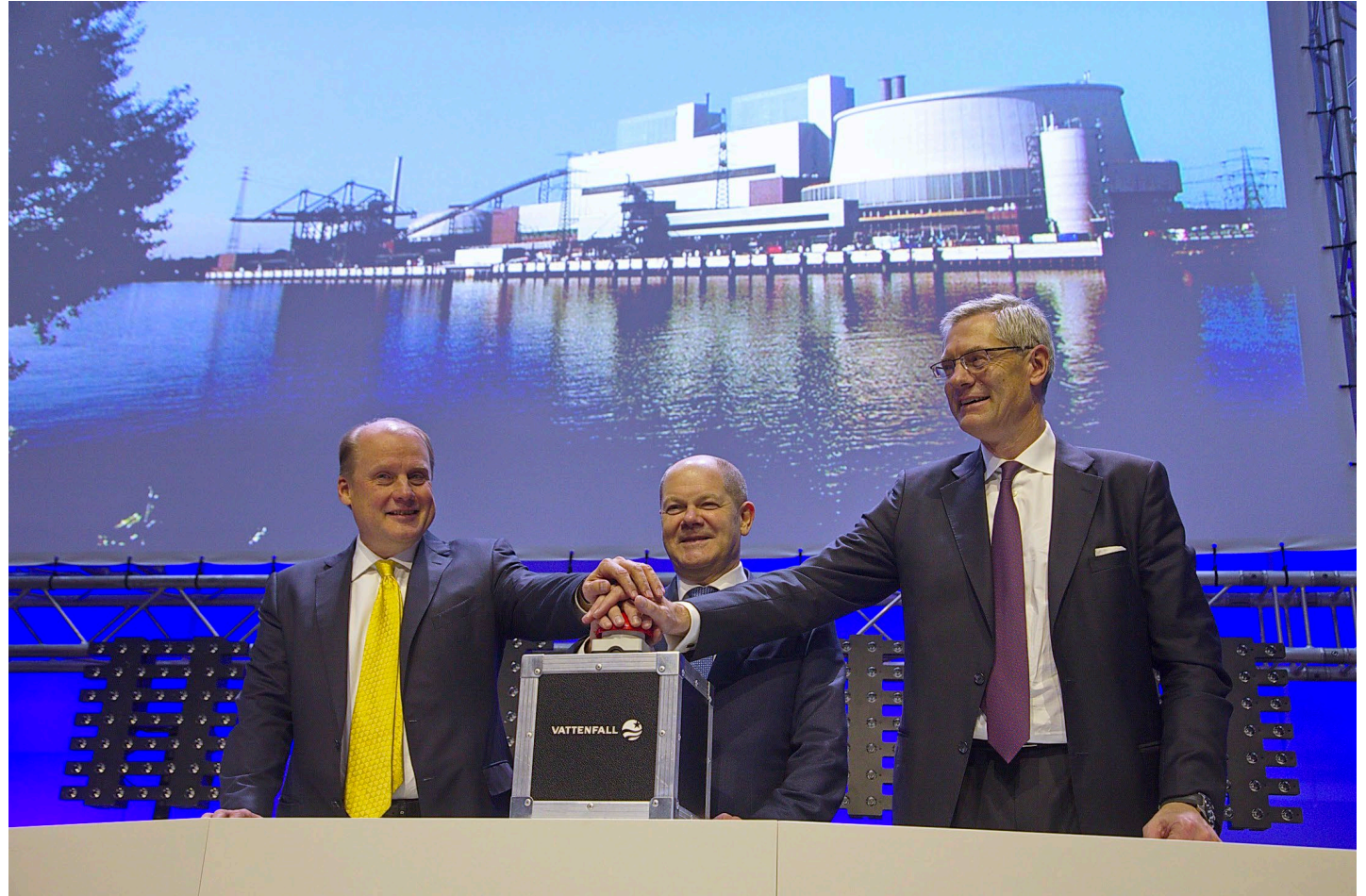


Force 1: Technological change

THE 2015 OPENING OF A HARDCOAL PLANT AS A TRANSITION SOLUTION WAS QUICKLY MADE OBSOLETE

Investment products need to allow for technological change and incentives to outperform for issuers.

=> Probability to achieve outcomes likely improves(*)



(*) of course, failure of technologies that are in current transition plans could also exert a drag on decarbonization.

Force 2: Electoral cycles

‘GREEN BACKLASH’ IN 2024 IS A CLEAR THREAT TO LONGER-TERM TRANSITION TARGETS

Investment products targeting long-term transition need to be insensitive to electoral changes/cycles in order for financing to deliver intended outcomes for investors.

=> Main risk currently seems to be on lowering probabilities to achieve decarbonisation (*)



(*) a different political landscape (into which we may shift) could generate improved probabilities of achievement

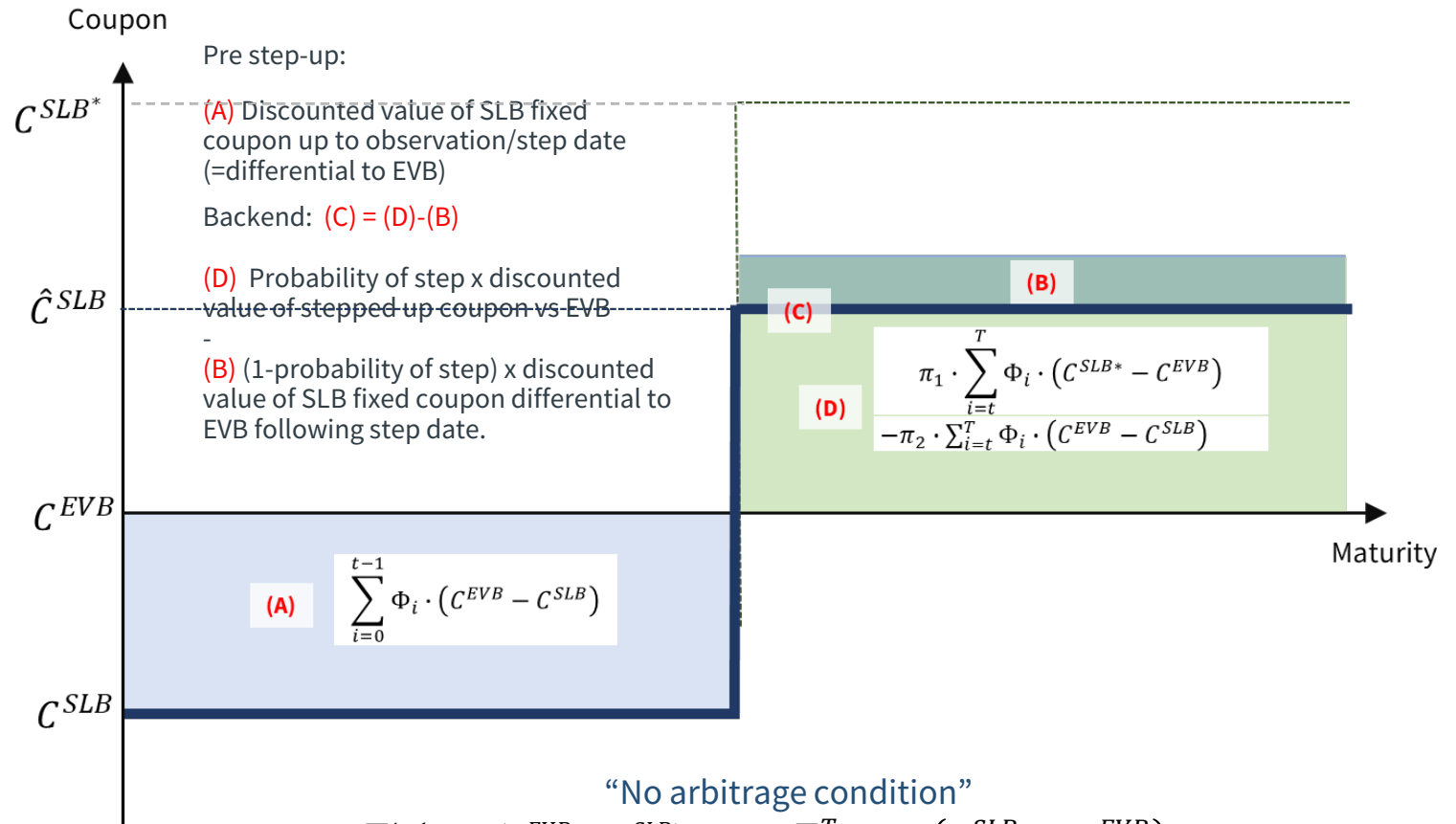
Probabilities are central in SLB (option) pricing

EXPECTED HIGHER BACKEND PAYOUT SHOULD BE MATCHED BY EARLIER “PREMIUM PAYMENT”

The probability to step (to achieve a target) is central in a sustainability-linked bond.

If the payout (in present value terms) of an SLB is \$1, and we have a 50% probability to step-up, the fair value of the SLB is 50c higher in price terms than for the equivalent vanilla bond (EVB).

Analogously, if the SLB price is 25c higher than the EVB, we can imply that the probability to step is only 25%.



“No arbitrage condition”

$$\sum_{i=0}^{t-1} \Phi_i \cdot (C^{EVB} - C^{SLB}) = \pi_1 \cdot \sum_{i=t}^T \Phi_i \cdot (C^{SLB*} - C^{EVB}) - \pi_2 \cdot \sum_{i=t}^T \Phi_i \cdot (C^{EVB} - C^{SLB})$$

More detail in Chapters 2 and 5 of [The Sustainability-Linked Bond Handbook](#)

A Twin Sustainability-Linked Government Bond

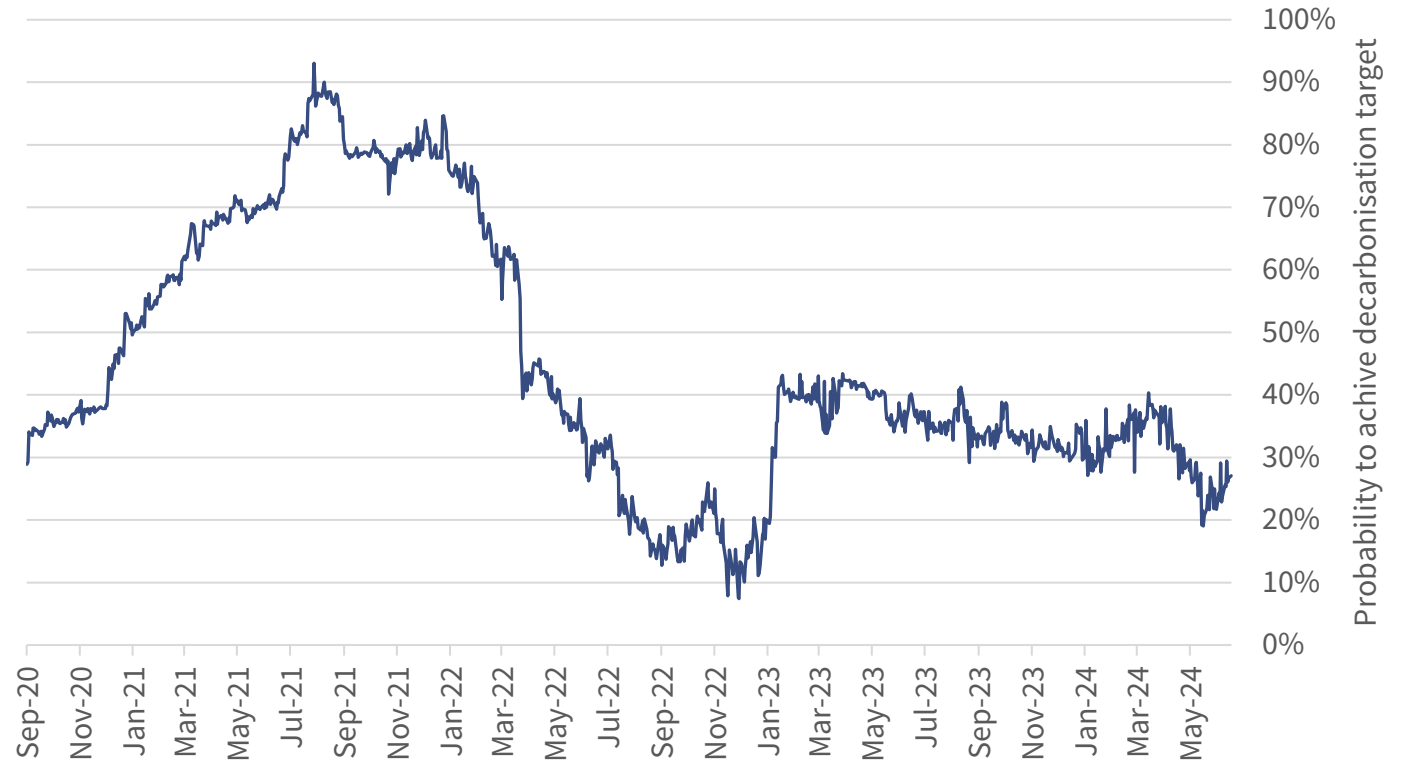
TWIN STRUCTURE LIKE THE GREEN BUND WOULD ALLOW EXACT IMPLIED STEP CALCULATIONS

What if markets could start to indicate the credibility of sovereign transition plans through pricing the probability that they will be achieved?

A twin sovereign sustainability-linked bond could actually achieve this.

Through observing the price differential/option premium, we could directly infer the probability that the sovereign will achieve their intended outcomes.

Hypothetical market implied probability that the sovereign issuer will hit their 2030 decarbonization target. Source: Bloomberg, AFII.

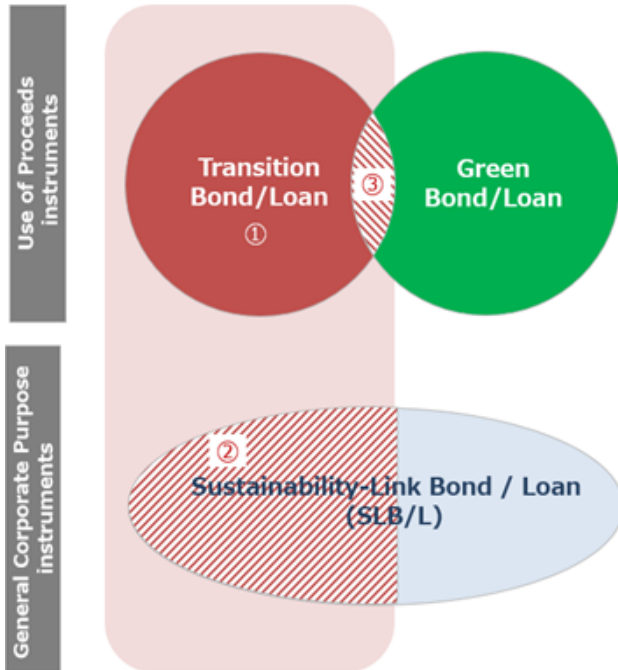


For a reflection on the twin bond format, see: [Green Bond Risk Premiums: A Twin-Bond ULFP Approach \(SSRN, 2020\)](#)

Sovereign transition financing complementarity

VANILLA, USE-OF-PROCEEDS AND SUSTAINABILITY LINKED IN A TRANSITION CONTEXT

Transition Finance (Concept)



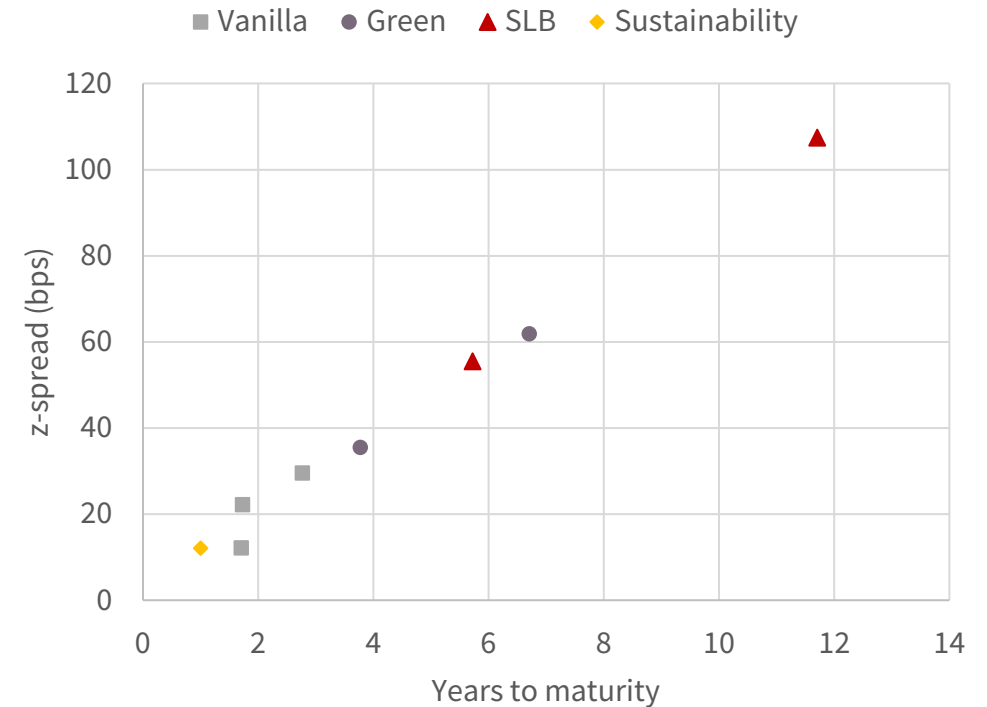
What is labeled "Transition"?

- ① Use of Proceeds instrument (bond or loan) that meets the four elements of transition (when the Use of Proceeds does not fall under Green Projects (*) but the process follows the existing principles and guidelines)
- ② General Corporate Purpose instrument (bond or loan) that meets the four elements of transition, sets targets in line with the transition strategy, and changes its financial and/or structural characteristics depending on the achievement of predefined targets
- ③ Instrument that meets the four elements of transition and follows the existing Green Bond Principles and the Green Bond Guidelines (when the Use of Proceeds falls under Green Projects*)

* Green Projects: Projects listed as Green Projects in the existing Green Bond Guidelines or those already issued.

https://www.meti.go.jp/english/policy/energy_environment/transition_finance/index.html

ADNA bond curve after triple-tranche issuance in May 2024 of vanilla, green and SLB



Research: "[Relative value is in the eye of the Ahold-er](#)"

Thank you!

[AFII website](#)

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