

NZAOA sustainability-linked bond workshop

15 November 2023

Anthropocene Fixed Income Institute (AFII)

The Anthropocene

The current geological age, viewed by scientists as the period during which human activity has been the dominant influence on climate and the environment.

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).



AFII team

RESEARCH/PORTFOLIO/ADVOCACY TEAM 2023



Ulf Erlandsson

Founder, CEO, Stockholm

With a PhD in Economics from Lund, Erlandsson worked at Barclays Capital before managing the credit portfolio at AP4. He has published several books on credit and thought-leader articles on the fixed income climate impact.



Justine Leigh-Bell

Executive Director, London

Formerly Deputy CEO of the Climate Bonds Initiative, Justine is highly experienced in building international organisations with a strong climate impact footprint. She has a M.Sc. in environmental technology from Imperial and post-graduate training in molecular genomics at Yale.



Josephine Richardson

Head of Research, London

Jo joined from JPMorgan where she has traded multiple areas of credit as well as modelling and valuation of derivatives. She has a MA Hons Mathematics from Trinity College Cambridge and is a Fellow of the Chartered Institute for Management Accountants.



Catherine Greene, CFA

Chief Impact Officer, London

With over 20 years' finance experience, much of it as an allocator to hedge and private equity funds while at Prudential M&G, a family office and International Asset Management, Catherine finished a Ph.D. at LSE in 2018, where she remains a Research Associate.



Stéphanie Mielnik, CFA

Research Director, Geneva

Previously at Northern Trust AM where she led the development of Climate/ESG funds and SFDR implementation, Stéphanie drives quantitative research at AFII.

She has a M.Sc. in financial engineering from Skema.



Umang Vithlani

Research Director, London

Formerly Head of Credit and Senior Portfolio Manager at Fideuram Asset Management, Umang has been managing fixed income portfolios for over twenty years.

He holds a BA in Accounting and Law from the University of Manchester.



Johan Jarnmo

Senior Associate, Portfolio Strategy, Stockholm

Joining AFII from a role as a Senior Risk Consultant at Deloitte, Johan wrote his master's thesis on carbon foot-printing of CDS baskets using ECOBAR. M.Sc. In Mathematical Statistics from Umeå University.



Kamesh Korangi

Quant Credit Strategist, London

Currently finishing a Ph.D. in deep learning application to credit risk management, Korangi has earlier in his career been a market maker in credit risk at Natwest. He has a degree in Computer Science and Engineering from IIT Madras, and an MBA from IIM Calcutta.



Emma Thorpe

Communications Director, London

Emma has previously held senior marketing roles at Bowmark Capital, Invest Europe, and The Carlyle Group, and now advises venture capital investors and startups on communications. Emma has a BA Hons in Philosophy, Politics and Economics from Oxford University.

Sustainability-Linked Bonds (SLB)

Agenda

1. Short introduction: changing sentiment around SLBs, key advantages and market/investor effects

2. An option pricing approach to SLBs

Case study: Enel; other SLBs reaching KPI dates

3. Pricing ambition

Case study: Japan

4. SLBs as an engagement tool and driver for better disclosure

Case studies: Sembcorp, JBS, Nobian

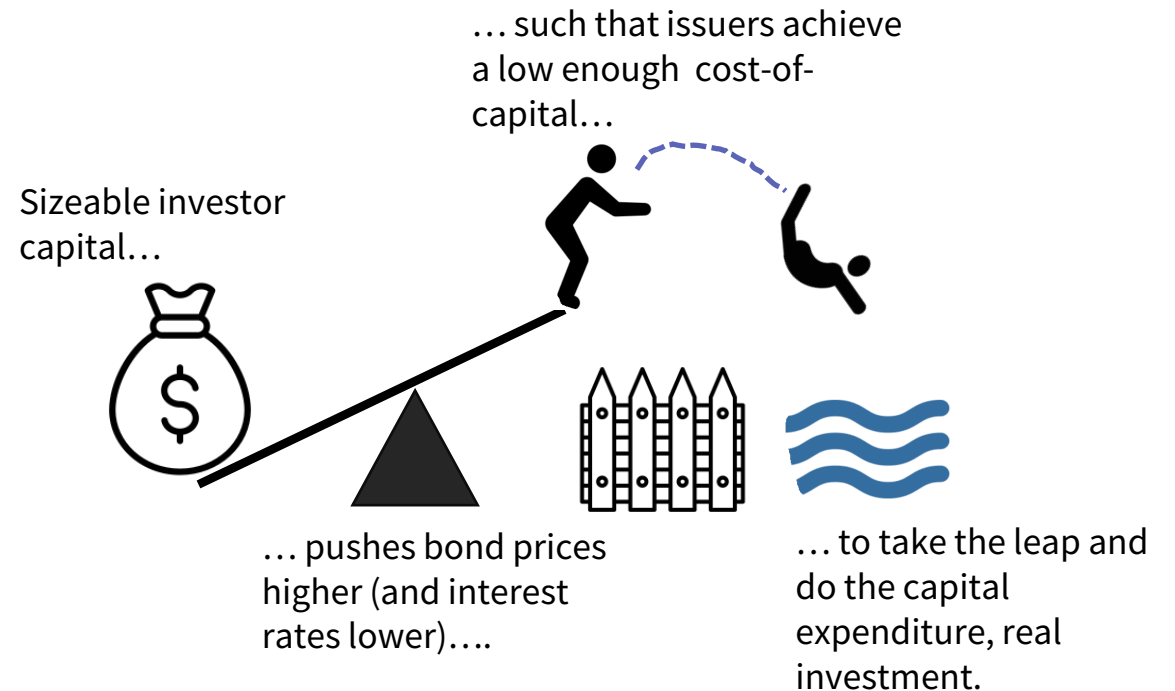
5 . Blending public and private capital through SLB structures: CORL bonds

General case studies

Hard-to-abate sectors: Airports, Chemicals

Sovereign: Chile, Uruguay

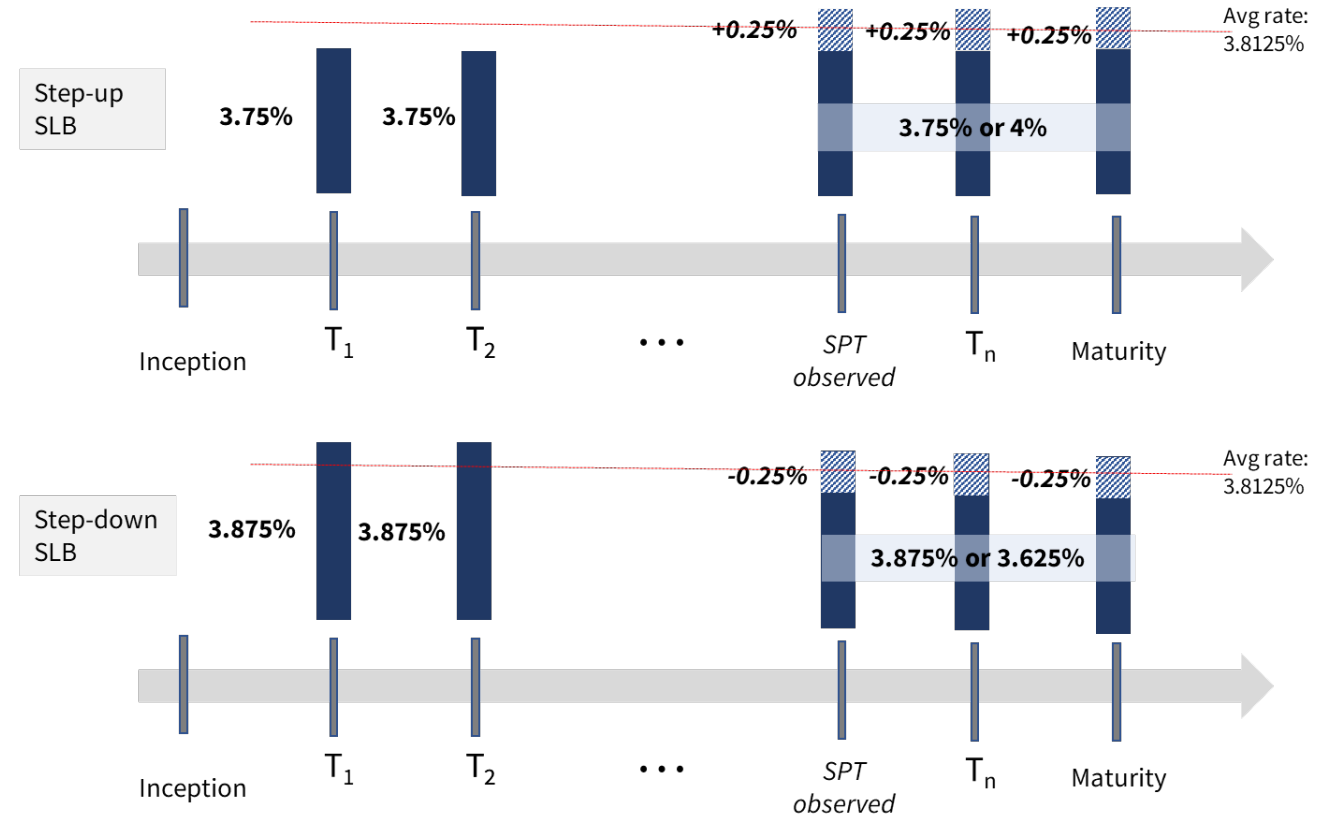
Financials: Nordea SLL bond



SLB introduction

WHAT IS A SUSTAINABILITY-LINKED BOND?

- Underlying instrument is a bond: Investors lend money for a set-length of time and receive a coupon
- Using a Key Performance Indicator (KPI), the issuer commits to achieving a Sustainability Performance Target (SPT)
 - KPIs are wide ranging. They can be numeric and continuous such as emissions or protected land. They can reference ESG ratings. They can also be binary, whether a certain policy is adopted or not
- The most common structure is that if the target is not achieved, a “step-up” coupon is paid to investors.
- Sometimes if a target is achieved, a “step-down” coupon is paid. This is more common in the Sustainability-Linked Loan (SLL) market and with sovereign issuers.



Media context

NEGATIVE PRESS SENTIMENT HAS RECENTLY BEEN BALANCED BY A MORE POSITIVE MOOD

“To get back to growth in 2023 and beyond, issuers of SLBs will have to find ways to address concerns flagged by market participants about the credibility of SLBs, namely surrounding issuer ambitions and incentives to achieve sustainability targets.” [S&P](#), Feb 2023.

“[in 2022] sustainability-linked bonds did not see a continuation of the halo effect it saw in 2021.” [HSBC](#), Feb 2023.

“Companies are getting something for nothing: Cheaper financing and an enhanced green reputation come without any real effort to deliver on climate goals and no chance of financial penalty.” [Bloomberg](#), Oct 2022.

“An enduring catch-22 is that when step-ups do happen, they can look bad for investors who buy SLBs in part to hit green financing targets. [...] It would be a sad extra dollar if the coupon were raised for that reason.” [FT](#), Feb 2023.

“The breakout in SLB issuance observed in recent quarters will also likely continue given the challenges that some EM issuers face in having a sufficient amount of eligible projects to support benchmark use-of-proceeds sustainable bonds.” [Moody's](#), Jun 2022.

“SLBs are fostering a dialogue between issuers and investors on the transition – and that to me is the additionality of SLBs.” [Environmental Finance](#), Apr 2023.

“For investors, SLBs are inherently superior to ordinary bonds.” [Global Capital](#), Apr 2023.

“Sovereign SLBs could help incentivise climate policies in EU countries, and accelerate emission reductions.” [Bruegel](#), Mar 2023.

Advantages of the SLB structure

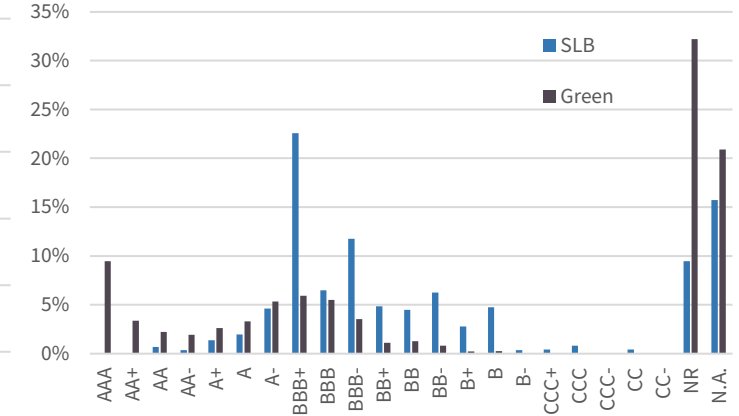
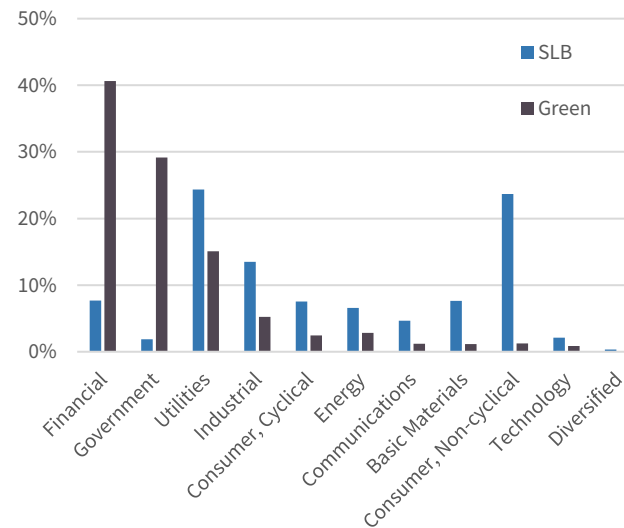
WHAT ARE THE KEY BENEFITS?

- **There is a clear exchange of value between issuer and investor**
 - › If an investor may receive an increased coupon in the future, they should rationally accept a lower coupon today. An ambitious target, i.e., a higher probability of the coupon stepping-up, should result in a lower cost of capital for issuers
 - › This is grounded in value transfer, and not supply/demand dynamics for sustainable debt
- **The issuer is making a high-level (“strategy”) sustainability commitment**
 - › The sustainability target applies to the issuer in its entirety, compared to products where capital is designated for selected sustainable investment only
- **The sustainability objectives are outcome-focused**
 - › Sustainability performance is measured at the end of the CAPEX investment, to see if improvements were delivered
 - › Outcome focused (SLB) investors complement use-of-proceed focused investors by ensuring strategy alignment,
- **SLBs increase transparency**
 - › Even a poorly structured SLB can improve disclosure and investor dialogue
- **SLBs are investable in “traditional” mandates**
 - › Similarly to green bonds, SLBs do not require substantial mid/back or other operational modifications.

SLBs are complementary

BROAD ACCESSIBILITY, COMPLEMENTARY ISSUANCE PROFILE TO GREEN BONDS

- **SLBs are used by a broad range of sectors**, including hard-to-transition industries which find it hard to attract more traditional ‘green’ capital but are essential for transition.
- **SLBs are used more by lower rated issuers** including HY companies. This data suggests the market demands sustainability commitments and targets to access the capital markets.
- **SLBs are particularly popular in emerging markets (ex-Asia)**, increasingly for sovereigns, where there are challenges in having sufficient eligible projects for green issuance. Wider adoption in Asia represents an opportunity for transition in that region.
- Research: "[SLBs: complementary, my dear Investor](#)"



	Total green issuance (\$bn)	Percentage of green issuance	Total SLB issuance (\$bn)	Percentage of SLB issuance
North America	233.0	12%	27.6	14%
Europe	1,116.4	56%	115.0	57%
APAC (ex China)	224.6	11%	14.6	7%
China	353.6	18%	13.7	7%
Emerging Markets (ex APAC)	73.8	4%	30.9	15%

SLB as risk management tool for investors

SUSTAINABILITY IS A RISK STRIPE WHICH FORMS PART OF CREDIT RISK MANAGEMENT

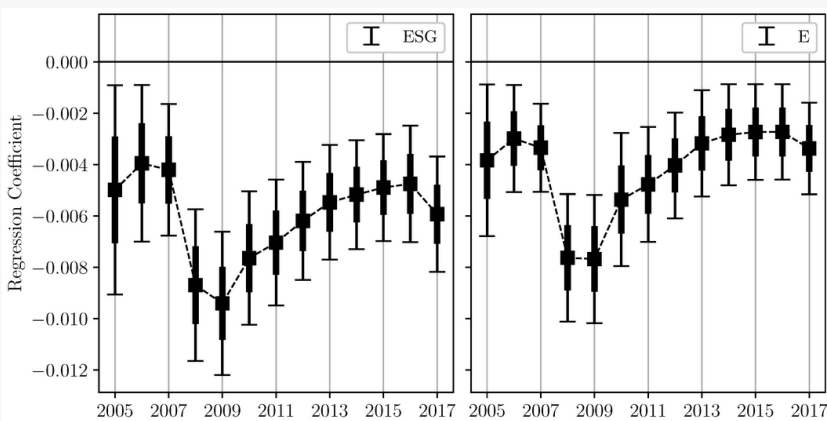
- Sustainability performance is correlated with probability of default ([Aslan et al. 2021](#)).
- If missing an SPT drives credit widening, an SLB should outperform traditional debt.

SLBs offer a hedge against poor sustainability performance and correlated fundamental credit deterioration in the most relevant sectors.

Investor flows in themselves may also be important: a credit underperforming in sustainability achievements may see divestments from ESG type of funds. The SLB then works as a hedge versus technical flows.

- Research: "[Understanding dynamics between SLB and traditional debt](#)"

Coefficient estimated for E(SG) scores and probability of default. Aslan et al. 2021.



Active managers in SLBs near triggers. AFII, Feb 2023.

Figure 1. Classification of funds holding Nobian and PPC SLBs. Source: Bloomberg, AFII, accessed 22 Feb 2023.

	NOHOLB		Percentage (excl CDO/CLO)		PPCGA	
	215,921	3.625%	Percentage	3.875%	26s	Percentage
CDO/CLO	215,921	59%	0	0%		
Active	128,049	35%	84%	270,062	92%	
Passive	11,153	3%	7%	19,714	7%	
ESG	12,955	4%	9%	2,836	1%	
TOTAL	368,078			292,612		
Outstanding	525,000			775,000		

Callability in SLBs

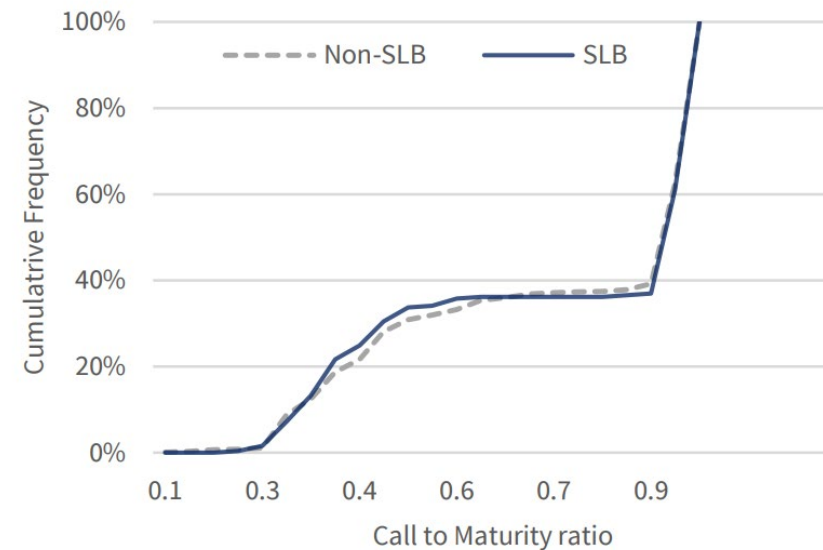
NO MATERIAL DIFFERENCE IN CALL DISTRIBUTIONS IN SLBs COMPARED TO TRADITIONAL DEBT

- A common criticism of SLBs has been around callability, whether issuers include this feature to wiggle out of sustainability commitments
- We conducted a comprehensive study on all SLB issuance, compared with traditional debt, to analyse differences

In summary

- We found scant quantitative evidence to support the critique
- We observed no material difference in the proportion of SLBs that are callable compared to similar bonds
- The date of SLBs' first call options aligns with the overall market
- In outstanding SLBs, the value of the call options is relatively small, given interest rates have risen substantially since issuance. Thus, the likelihood of SLBs being called in current market conditions is very small.
- Research: "[SLBs: no cal\(l\)amity](#)"

Figure 1. Cumulative distribution plot of call-to-maturity ratios for SLBs and comparable non-SLBs.



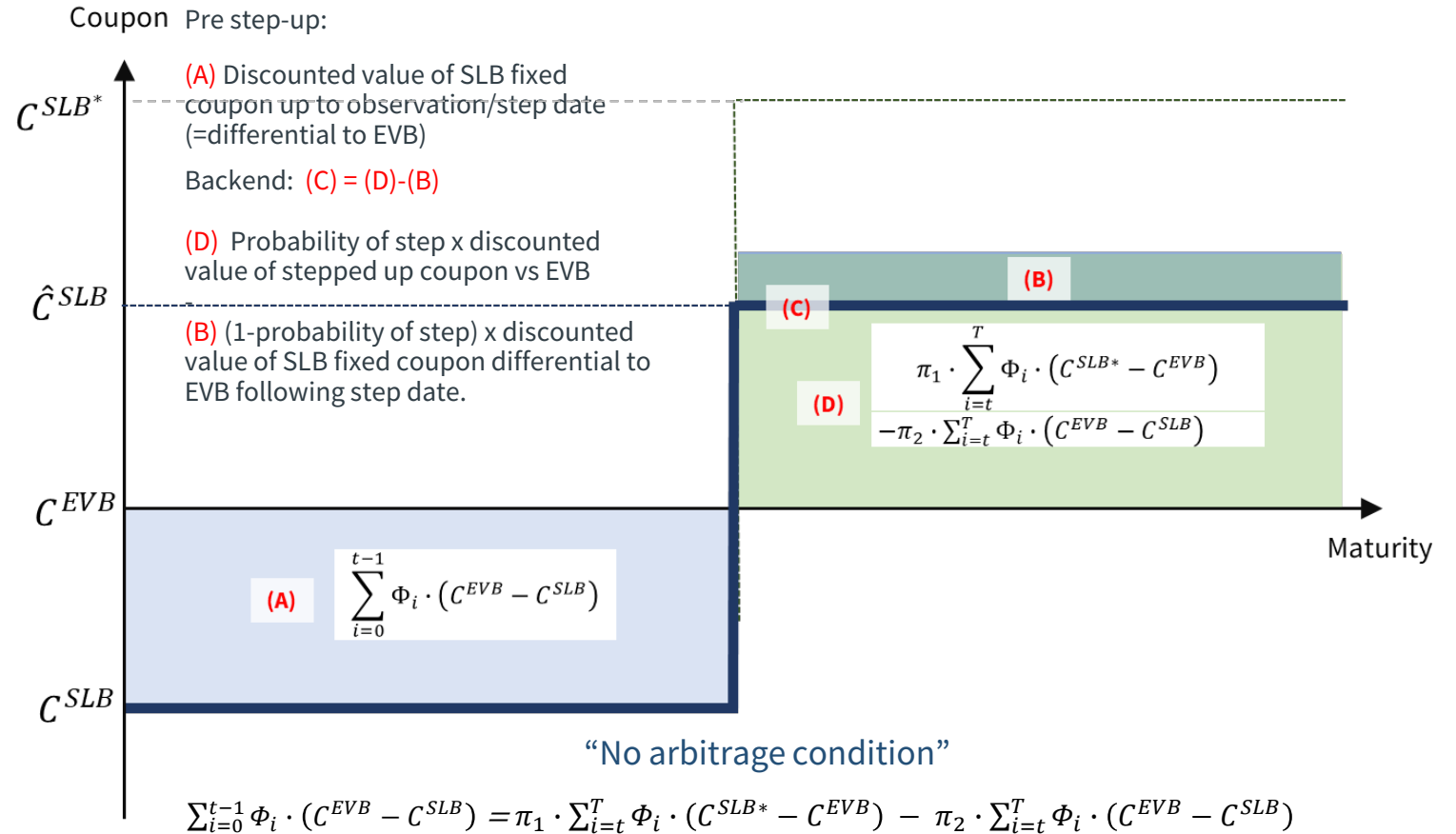
Pricing of SLBs as options

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

- A natural way to price the optionality provided in an SLB is to use the condition

“The (discounted) expected value of the payouts after the observation date must be balanced by the (discounted) negative value of the lower payments prior to the observation date.”

- In a step-up, as there is a chance the investor will receive a higher coupon in the future, they should be happy to accept a lower coupon today.
- Therefore, the issuer should see a discounted cost of capital if they are successful in achieving sustainability targets.



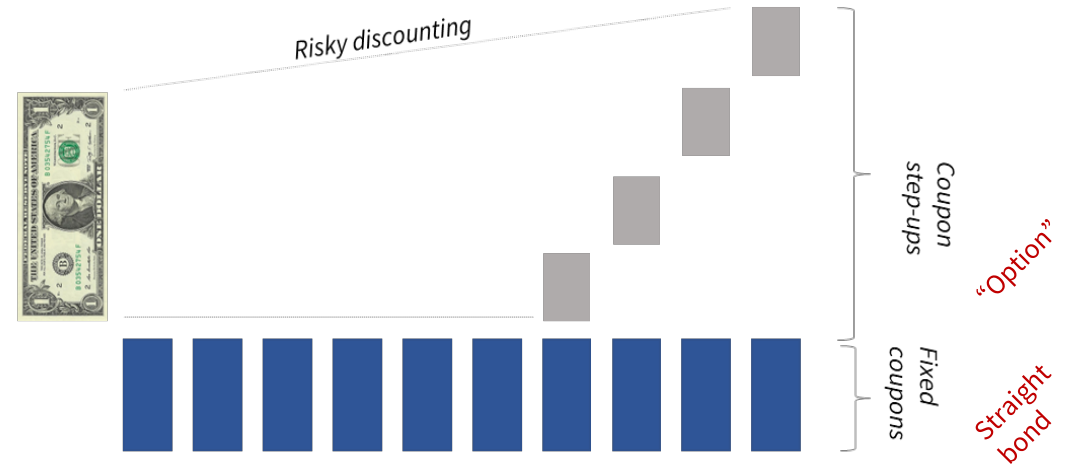
- Research: [“Notes on risk-neutral pricing of SLBs and step-down structures”](#)

Pricing in sustainability ambition in SLBs

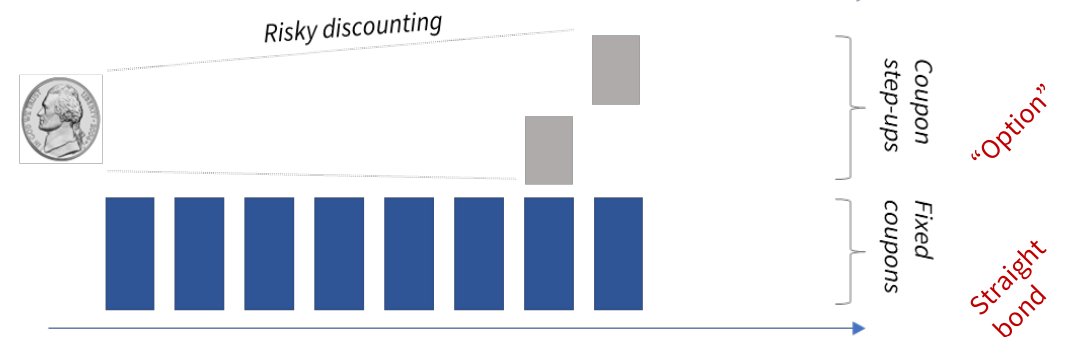
DRIVING AMBITION (AND FIDUCIARY DUTY ALIGNMENT) THROUGH OPTION PRICING

- The issuer sells an option on a future cashflow; the investor buys that option.
- The size of the option is dependent upon coupon step size, and the step-up payout period. It is entirely deterministic.
- Ambition level is directly related to the option value in the SLB contract: it is the (inverse) of the probability that the issuer succeed with their targets.
- A greenback SLB is a definition to combine ambition and payout materiality in one concept:
- **A Greenback SLB: An ambitious (50% probability) SLB with a step valuation (step x payout period) such that the option is worth \$1 in bond price terms.**

Greenback SLB:
Risky PV of steps > \$1



Non-greenback SLB:
Risky PV of steps < \$1



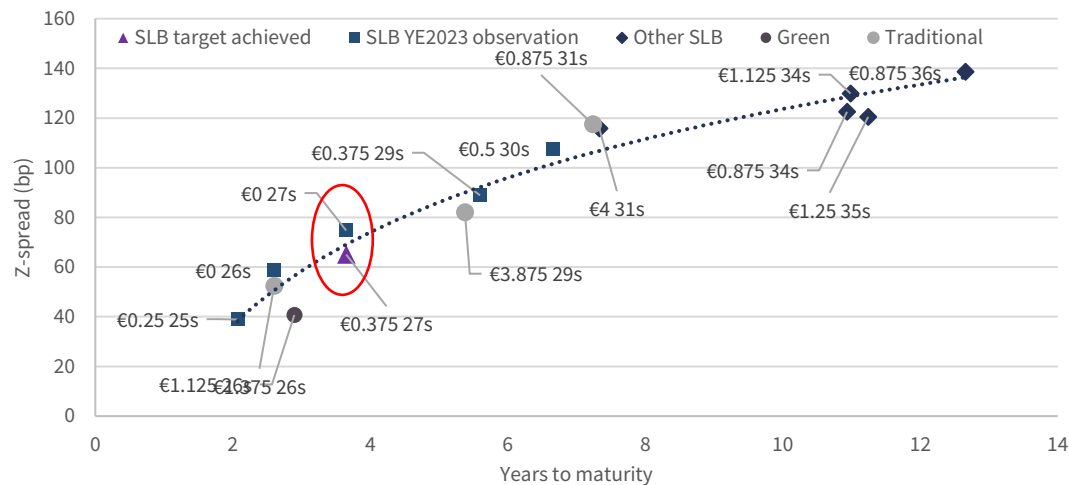
- Research: ["Greenback SLBs: an impact standardisation proposal"](#)

Enel year-end 2023 KPI observation

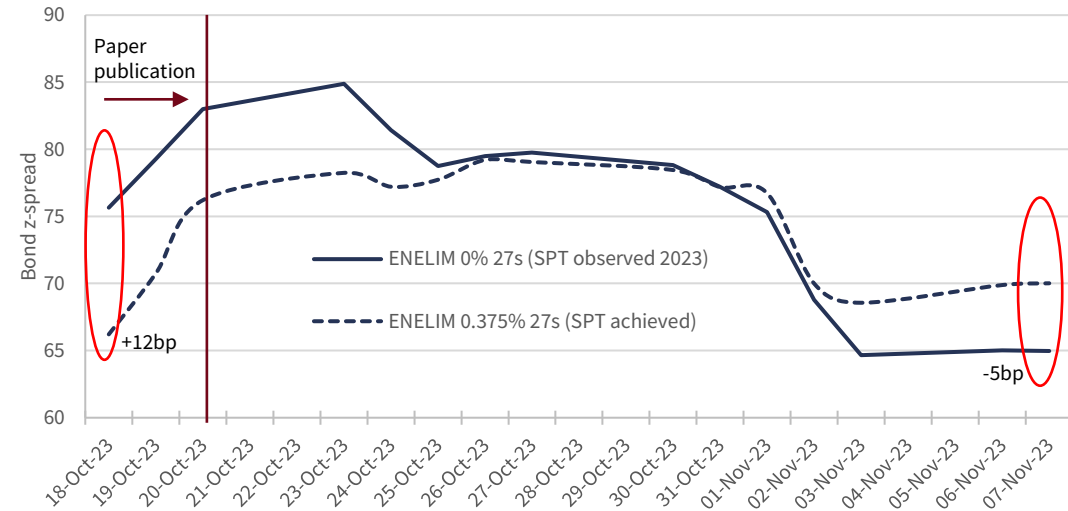
BOND MARKET MISPRICING CHANCE OF SPT MISS

- Our analysis suggests Enel is unlikely to achieve its 2023 target to reduce emissions intensity of power production.
- Ten bonds, with total notional \$10.8bn, would pay a 25bp step-up if the target is missed.
- Bond pricing initially showed limited value to the chance of receiving a step-up coupon (LHS), but has compressed since (RHS)

Enel EUR bond z-spreads. Source: Bloomberg, accessed 18 Oct 2023.



Enel EUR 2027 bond spreads. Source: Bloomberg, accessed 7 Nov 2023.



- Research: “[Enel SLBs: update on 2023 observation date](#)”

SLB market is reaching adolescence

REVIEW OF MORE BONDS REACHING THE OBSERVATION DATES

Table 1. SLBs with KPI observation date in 2023. Source: AFII, Bloomberg.

Issuer	ISIN	Issue Date	Maturity	Observation Date	Currency	Amount	
						Outstanding	Status
CHINA CONSTRUCT BANK/HK	XS2331713102	22-Apr-21	22-Apr-26	31-Dec-23	USD	0.55	Currently MET
ENEL FINANCE INTL NV	XS2353182020	17-Jun-21	17-Jun-27	31-Dec-23	EUR	1.00	Likely MISS
ENEL FINANCE INTL NV	XS2353182293	17-Jun-21	17-Jun-30	31-Dec-23	EUR	1.25	Likely MISS
ENEL FINANCE INTL NV	US29278GAN88	12-Jul-21	12-Jul-28	31-Dec-23	USD	1.00	Likely MISS
ENEL FINANCE INTL NV	US29278GAP37	12-Jul-21	12-Jul-31	31-Dec-23	USD	1.00	Likely MISS
ENEL FINANCE INTL NV	US29278GAM06	12-Jul-21	12-Jul-26	31-Dec-23	USD	1.25	Likely MISS
ENEL FINANCE INTL NV	XS2390400633	28-Sep-21	28-May-26	31-Dec-23	EUR	1.25	Likely MISS
ENEL FINANCE INTL NV	XS2390400716	28-Sep-21	28-May-29	31-Dec-23	EUR	1.00	Likely MISS
ENEL FINANCE INTL NV	XS2432293673	17-Jan-22	17-Nov-25	31-Dec-23	EUR	1.25	Likely MISS
ENEL FINANCE INTL NV	US29278GAV05	15-Jun-22	15-Jun-25	31-Dec-23	USD	0.75	Likely MISS
ENEL FINANCE INTL NV	US29278GAZ19	14-Oct-22	14-Oct-25	31-Dec-23	USD	0.75	Likely MISS
EQT AB	XS2338570331	14-May-21	14-May-31	31-Dec-23/31-Dec-26	EUR	0.50	MET 2023 target
FORVIA SE	XS2553825949	15-Nov-22	15-Jun-26	31-Dec-23	EUR	0.95	Currently MET
KNORR-BREMSE AG	XS2534891978	21-Sep-22	21-Sep-27	31-Aug-23	EUR	0.70	MET
ORBIA ADVANCE CORP SAB	US68560EAA64	11-May-21	11-May-26	31-Dec-23	USD	0.60	Likely MEET
PUBLIC POWER CORP	XS2359929812	21-Jul-21	31-Jul-28	31-Dec-23	EUR	0.50	Likely MISS
REXEL SA	XS2332306344	05-May-21	15-Jun-28	31-Dec-23	EUR	0.40	Currently MET
REXEL SA	XS2403428472	10-Nov-21	15-Dec-28	31-Dec-23	EUR	0.60	Currently MET
SAN MIGUEL INDUSTRIAS	US79911QAA22	02-Aug-21	02-Aug-28	31-Dec-23	USD	0.38	50:50
YUNNAN ENERGY INST OVR	XS2445143329	21-Apr-22	21-Apr-25	31-Dec-23	USD	0.23	Likely MEET

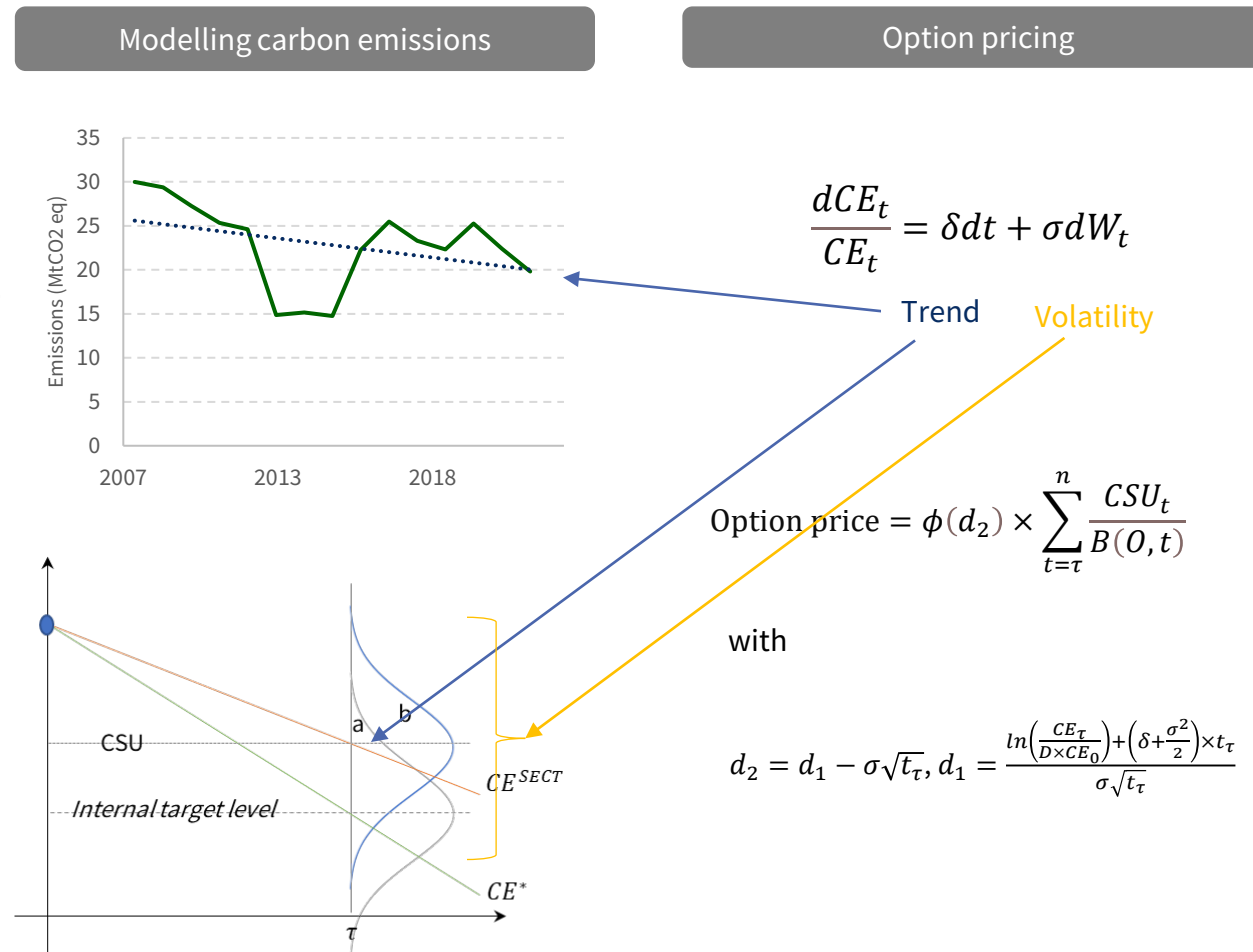
2023 is the first year we are getting more of a sample to see how (early vintages) SLBs are behaving as SPTs start to roll on.

- Research: [“SLBs: a summary of 2023 targets”](#)

Understanding probability of step

VOLATILITY IN THE BLACK-SCHOLES MODEL COULD BE INTERPRETED AS SLB PROBABILITIES

- Using the option approach, we can use “traditional” option pricing (e.g. Black and Scholes) to price the coupon step.
- We make the distinction between **priceable** and **non-priceable** SLBs, where in the former case, there is data and/or other ways to make probabilistic inference on the coupon step happening.
- The pricing model allows the investor/issuer to determine fair-value spread/price differentials to vanilla bonds.
- NB! The spread differential between an SLB with priceable optionality and a vanilla bond is not a “greenium” (as understood as a non-financial demand factor) but is entirely motivated by the pricing theory. This is important for fiduciary duty considerations.**
- Research: [“An option pricing approach for sustainability-linked bonds”](#)

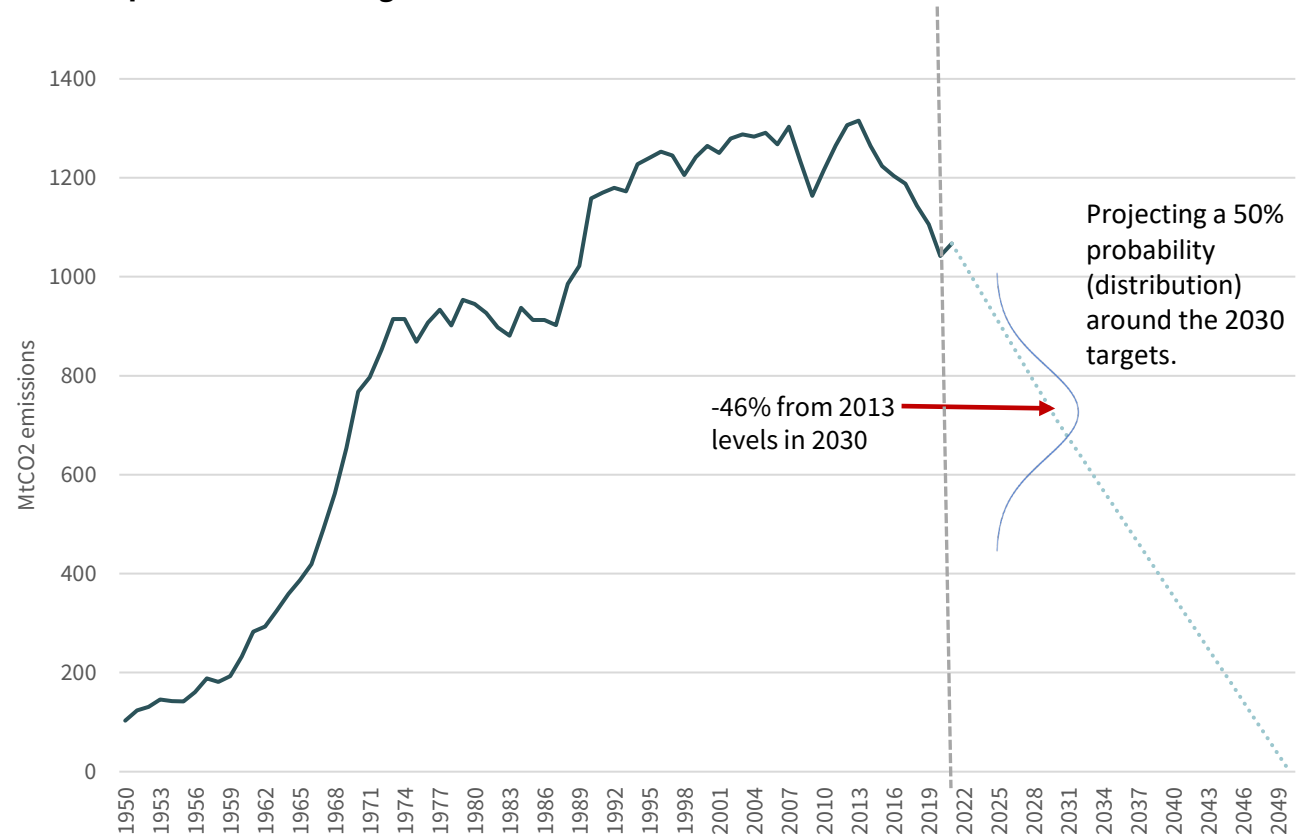


Japan's GX program: SLB to complement UoP bonds?

SOVEREIGNS PROVIDE GOOD KPI DATA BUT HAVE SUBSTANTIAL STRATEGY BREAK RISK

- Japan's plans to issue transition ("GX") bonds: should we engaged for an alternative SLB structure tied to emissions rather than capex...
- ... especially when that capex has been tied to unproven technologies, such as ammonia-coal cofiring.
- Sovereigns' emissions targets seem relatively well-suited for the option pricing approach.
- Hypothetical USD issuance:
 - 2030 SPTs, 50bps step-up on missing (-46%), 25bps step-down on reaching fair share 1.5c target (-56%)
 - 2034 (10y) maturity
 - Indicative issuance level: CT10+33 [+7bp of optionality]

Japan's national CO2 emissions peaked in early 10s, committed reductions are ambitious, but not impossible considering the 2010-2020 reduction rates.



Sources: [JapanGov: Carbon neutrality, How Japan could reach carbon neutrality by 2050](#) | [McKinsey](#)

SLBs have opportunity and incentive to lead on engagement

SLBS AS A DERIVATIVE ON SUSTAINABILITY PERFORMANCE AND REPORTING

- SLB investors have a unique role in insisting on clear, accurate and timely disclosure, to the benefit of other stakeholders in companies and issuers

Sembcorp: “Carbon footprint arbitrage of a lifetime”

Ulf Erlandsson^(), Cedric Rimaud, CFA*

Public-to-private transactions that shift fossil ‘assets’ into private hands are a key theme in global sustainable finance and pose several important questions around investors’ role as providers of capital. Singaporean infrastructure/energy owner Sembcorp (Ticker: SCISP) is a particularly relevant example, also with implications for the sustainability-linked bond (SLB) market.

Nobian SLB: a lot of hot air?

Josephine Richardson^()*

Nobian (ticker NOHOLB), a privately-owned European chemical company, has just released its 2022 sustainability report.¹ Showing a significant drop in emissions, the company has avoided paying a coupon step up to its Sustainability-Linked Bond (SLB) bondholders. However, it is unclear how this emissions reduction has been achieved.

- Research: “[Sembcorp: ‘Carbon footprint arbitrage of a lifetime’](#)”, “[Nobian SLB: a lot of hot air?](#)”, “[The Forensic Carbon Accountant: JBS SLB](#)”

The Forensic Carbon Accountant: JBS SLB

Josephine Richardson^(), Stéphanie Mielnik*

JBS, a Brazilian meat producer, is a company with significant sustainability issues linked to deforestation. It is currently seeking a US stock listing, which is raising scrutiny of both its environmental commitments and its corporate governance.¹

Blending public and private capital in SLB type structures

CONTINGENT RESILIENCE-LINKED (CORL) BONDS USE CREDIT ENHANCEMENTS TO MAKE STEP DOWN STRUCTURES APPEALING TO INVESTORS



- An estimated \$1.3trn is needed for resilience but expected to bring \$7trn of economic benefit vs baseline.
- The development community is struggling to mobilise private finance for the Sustainable Development Goals (SDGs), especially in sectors and geographies where funding is most needed.
- And yet, private investors seem increasingly keen to adopt environmental, social and governance criteria and are gradually aligning investments with the SDGs.
- But, for lack of consistent incentives, development finance institutions (DFIs) including multilateral development finance institutions (MDFIs) are failing to stimulate SDG-aligned private investment.

[...]

“[Making private finance work for the SDGs](#)”, OECD, July 2022

- “[Bond market innovation can unlock private capital for sustainable development](#)”, Responsible Investor.

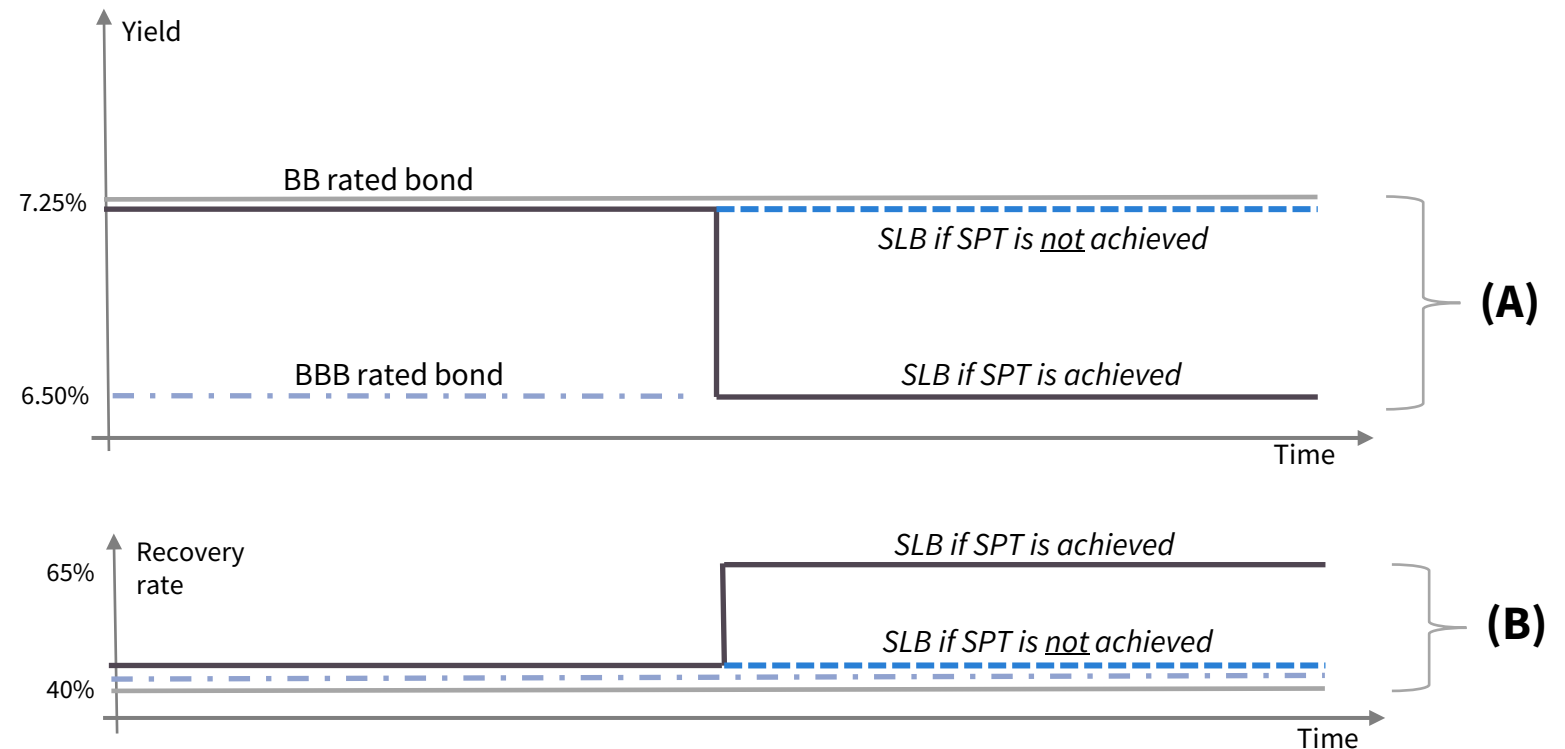
CORL bonds: SLB step-downs pricing flat to vanilla bonds

HOW IT WORKS

CORL bonds assume that some concessionary money provides a higher recovery rate on the bonds if there has been SPT achievement + a default.

The value of this **(B)** is used to compensate investors for getting a lower coupon due to the step-down **(A)**.

Step-sizes can be calibrated based on the enhanced recovery rate such that an investor would be indifferent between the CORL bond and a vanilla BB bond.



- Research: "[Contingent Resilience-Linked \(CORL\) bonds: combining public and private capital for resilience](#)"

CORL bonds: flexible structures

“SIMPLE” STRUCTURE WITH PUBLIC MONEY CREDIT ENHANCEMENT

- The basic CORL idea can be executed in a variety of combinations, and the appetite to provide enhanced recovery will directly related to possible step-down sizes.
- NPVs of all legs clearly defined ⇔ capital efficient for the DFI/credit enhancement provider.
- Clear investor upside if SPT achievement is correlated to credit improvement.

Year	(A) Vanilla BB bond		(B) -1% stepdown		(C) -1.0% SD and 56% non-cont. recovery		(D) -0.25% SD and 63% contingent recovery		(E) Greenback non-contingent- 0.72% SD 52% NC recovery		(F) CORL semi-contingent -0.50% SD 45% NC R, 63% contingent R		(G) Hybrid BB(1-5)/BBB(6-10) SD -0.37% cont. 63% recovery			(H) BB+ EVB			(K) BB+ upgrade, SD -1.25% cont. 60% recovery	
	Disc. Coupon	Expected recovery	Disc. Coupon	Expected recovery	Disc. Coupon	Expected recovery	Disc. Coupon	Expected recovery	Disc. Coupon	Expected recovery	Disc. Coupon	Expected recovery	Nominal	Disc. Coupon	Expected recovery	Nominal	Disc. Coupon	Expected recovery	Disc. Coupon	Expected recovery
1	6.500	2.087	6.500	2.087	6.500	2.922	6.500	2.087	6.500	2.713	6.500	2.348		6.500	2.087		6.603	1.518	6.603	1.518
2	5.989	1.403	5.989	1.403	5.989	1.965	5.989	1.403	5.989	1.824	5.989	1.579		5.989	1.403		6.157	1.027	6.157	1.027
3	5.539	1.355	5.539	1.355	5.539	1.898	5.539	1.355	5.539	1.762	5.539	1.525		5.539	1.355		5.766	0.992	5.766	0.992
4	5.239	0.508	5.239	0.508	5.239	0.712	5.239	0.508	5.239	0.661	5.239	0.572		5.239	0.508		5.477	0.407	5.477	0.407
5	4.925	0.486	4.925	0.486	4.925	0.681	4.925	0.486	4.925	0.632	4.925	0.547		4.925	0.486		5.170	0.389	5.170	0.389
6	4.637	0.215	3.997	0.215	3.997	0.302	4.477	0.339	4.176	0.280	4.317	0.339		4.418	0.170		4.876	0.180	4.035	0.269
7	4.348	0.204	3.748	0.204	3.748	0.285	4.198	0.321	3.916	0.265	4.048	0.321		4.161	0.160		4.580	0.170	3.790	0.255
8	4.058	0.284	3.498	0.284	3.498	0.398	3.918	0.448	3.655	0.370	3.778	0.448		3.892	0.376		4.280	0.269	3.542	0.404
9	3.745	0.266	3.228	0.266	3.228	0.372	3.616	0.419	3.373	0.345	3.486	0.419		3.599	0.351		3.955	0.251	3.273	0.377
10	3.366	0.242	2.902	0.242	2.902	0.339	3.250	0.381	3.032	0.315	3.134	0.381	47.128	3.242	0.320	49.099	3.560	0.229	2.946	0.343
BPC	48.346	7.052	45.566	7.052	45.566	9.873	47.651	7.749	46.344	9.168	46.956	8.479	47.128	47.506	7.217	49.099	50.424	5.431	46.760	5.980
Bond price		101.824		99.044		101.865		101.825		101.938		101.860			101.851			104.954		101.840

Case study: Hard-to-abate sector - Airports

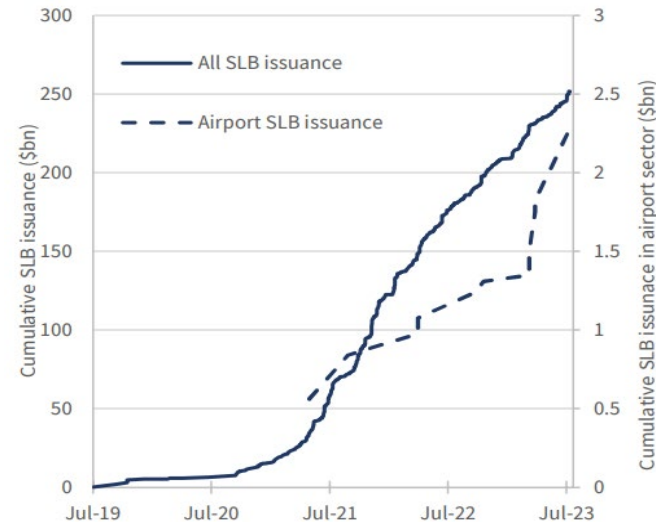
A MATERIAL RISK FOR BONDHOLDERS

- Controversies around green bonds in sector, Mexico City Airport, Hong Kong, Swedavia
- Heathrow structure was ambitious, all emissions ‘on the ground’ and ‘in the air’ were included
- Established usage of SLL in the sector

Table 2. SLB issuance in airport sector. Source: Bloomberg, accessed 13 Jul 2023.

Issuer	Ticker	ISIN	Issue Date	Maturity Date	Issue Amount (bn)	Currency
AEROPORTI DI ROMA SPA	ADRIT	XS2337326727	30-Apr-21	30-Jul-31	0.50	EUR
CAPITAL AIRPORT GROUP	CAPAPT		27-Aug-21	27-Aug-26	2.00	CNY
GPO AEROPUER CENTRO NORT	GACENO	MX910M000050	31-Mar-22	22-Mar-29	2.30	MXN
GPO AEROPUER CENTRO NORT	GACENO	MX910M000068	31-Mar-22	25-Mar-27	1.70	MXN
GRUPO AEROPORTUARIO DEL-	GAPBMM	MX91GA0000E0	26-Sep-22	21-Sep-26	2.76	MXN
YUNNAN AIRPORT GROUP	YNARPT	CND10005RGP7	19-Oct-22	19-Oct-25	0.50	CNY
GPO AEROPUER CENTRO NORT	GACENO	MX910M000084	10-Mar-23	24-Jul-26	0.64	MXN
GPO AEROPUER CENTRO NORT	GACENO	MX910M000076	10-Mar-23	01-Mar-30	2.56	MXN
GRUPO AEROPORTUARIO DEL-	GAPBMM	MX91GA0000F7	27-Mar-23	18-Mar-30	4.28	MXN
GRUPO AEROPORTUARIO DEL-	GAPBMM	MX91GA0000G5	27-Mar-23	23-Mar-26	1.12	MXN
AEROPORTI DI ROMA SPA	ADRIT	XS2644240975	10-Jul-23	10-Jul-33	0.40	EUR
HEATHROW FUNDING LTD	HTHROW	XS2648080229	11-Jul-23	11-Jul-33	0.65	EUR

Figure 2. Cumulative issuance for SLB market compared to airport sector. Source: Bloomberg, accessed 17 Jul 2023.



- Research: [“Airport Sustainability-Linked Bonds: clear for takeoff”](#)

Case study: chemical SLBs

ANALYSING USAGE IN A HARD-TO-ABATE SECTOR

- SLBs support enhanced sustainability dialogue between investors and issuers
- Given diverse business operations, scientific validation of targets is essential
- Climate impact of chemicals sector is hard to capture with emissions measurement alone. Other themes of KPIs have been observed
 - › Recycling and waste management
 - › Water consumption
 - › Non GHG emissions
- Materiality of structures is still too low to be classified as ‘Greenback’ SLBs
- Research: [“Chemicals sector: synthesising impact with SLBs”](#)

Table 1. SLBs in the Chemical sector. Source: Bloomberg, AFII, accessed 13 Jun 2023.

Issuer	ISIN	Issue date	Maturity	Currency	Amount outstanding (\$bn)	Composite rating
Arakawa Chemical Industries Ltd	JP312500AMB9	26-Nov-21	26-Nov-26	JPY	0.0	N.A.
Braskem Idesa SAPI	US10554NAB47	20-Oct-21	20-Feb-32	USD	1.2	B+
FIS Fabbrica Italiana Sintetici SpA	XS2436585355	10-Feb-22	01-Aug-27	EUR	0.4	B
Herens Holdco Sarl	US427169AA59	14-May-21	15-May-28	USD	0.4	B-
Herens Midco Sarl	XS2340137343	14-May-21	15-May-29	EUR	0.5	CCC
Indorama Ventures PCL	TH102703C509	03-Nov-21	03-May-32	THB	0.1	N.A.
Indorama Ventures PCL	TH1027038B08	03-Nov-21	03-Nov-28	THB	0.1	N.A.
Indorama Ventures PCL	TH1027036B00	03-Nov-21	03-Nov-26	THB	0.1	N.A.
Itelyum Regeneration Spa	XS2389112736	01-Oct-21	01-Oct-26	EUR	0.6	B
LANXESS AG	XS2415386726	01-Dec-21	01-Dec-29	EUR	0.6	BBB
LANXESS AG	XS2459163619	22-Mar-22	22-Mar-28	EUR	0.6	BBB
Lune Holdings Sarl	XS2406727151	18-Nov-21	15-Nov-28	EUR	0.5	B
Nagase & Co Ltd	JP364780AN64	09-Jun-22	09-Jun-32	JPY	0.1	N.A.
Nobian Finance BV	XS2358383466	01-Jul-21	15-Jul-26	EUR	0.6	B
Orbia Advance Corp SAB de CV	US68560EAB48	11-May-21	11-May-31	USD	0.5	BBB-
Orbia Advance Corp SAB de CV	US68560EAA64	11-May-21	11-May-26	USD	0.6	BBB-
Orbia Advance Corp SAB de CV	MX91OR010021	08-Dec-22	25-Nov-32	MXN	0.4	N.A.
Orbia Advance Corp SAB de CV	MX91OR010013	08-Dec-22	04-Dec-25	MXN	0.1	N.A.
RED Surcos SA	ARREDS5600D5	08-Jun-22	08-Jun-24	USD	0.0	N.A.
RED Surcos SA	ARREDS5600E3	29-Sep-22	29-Sep-25	USD	0.0	N.A.
Xinjiang Zhongtai Chemical Co Ltd	N/A	22-Mar-23	22-Mar-28	CNY	0.1	N.A.

Case study: Chile

THE FLAGSHIP SOVEREIGN SLB ISSUER – NOW SECOND LARGEST OVERALL

- In summer 2023, Chile issued four new SLBs, joining its first from Mar 2022, bringing its total volume to \$8.1bn
- The new structures are commendable for increased materiality; i.e., higher step-up coupons paid for a longer period of time

Table 1. SLB issuance by issuer. Source: Bloomberg, accessed 24 Jul 2023.

Issuer	Count of SLBs	Total SLB Issued (\$ bn)
ENEL FINANCE INTL NV	30	31.1
REPUBLIC OF CHILE	5	8.1
TEVA PHARM FNC NL II	8	7.5
ENBRIDGE INC	5	5.1
ENI SPA	3	4.2
ASTM SPA	3	3.4
FORVIA	3	3.2
CARREFOUR SA	4	3.0
JBS USA/FOOD/FINANCE	3	3.0

Table 2. SLB issuance with outstanding maturity greater than ten years. Source: Bloomberg, accessed 28 Jun 2023.

Issuer	ISIN	Amount Issued (\$ bn)	Maturity date
REPUBLIC OF CHILE	US168863EA21	1.10	05-Jan-54
REPUBLIC OF CHILE	US168863DY16	2.00	07-Mar-42
ENEL FINANCE INTL NV	XS2353182376	1.19	17-Jun-36
REPUBLIC OF CHILE	US168863DZ80	1.15	07-Jan-36
REPUBLICA ORIENT URUGUAY	US760942BE11	1.50	28-Oct-34
ENEL FINANCE INTL NV	XS2390400807	1.46	28-Sep-34
REPUBLIC OF CHILE	XS2645248225	0.82	05-Jul-34
ASTM SPA	XS2412267788	1.12	25-Nov-33

- Research: [“Chile’s Peso SLB issuance”](#), [“Offi-Chile the largest sovereign SLB issuer”](#), [“Chile sustainability-linked bond: Optionality analysis”](#)

Case study: Uruguay step-up/step-down SLB

AN INNOVATIVE SYMMETRIC STRUCTURE, OUTPERFORMED WHEN POOR DATA WAS RELEASED

- URUGUA \$5.75 34s was issued wide of curve in Oct 2022
- Option value estimated at -1.8bp, negative as on average a step-down was expected

- SLB has outperformed since issuance
- Option value now estimated at +7.9bp running, driven by poor GHG emissions reporting
- Example of SLB structure providing a hedge to investors

Figure 1. Uruguay bond spreads. Source: Bloomberg, accessed 10 Jan 2023.

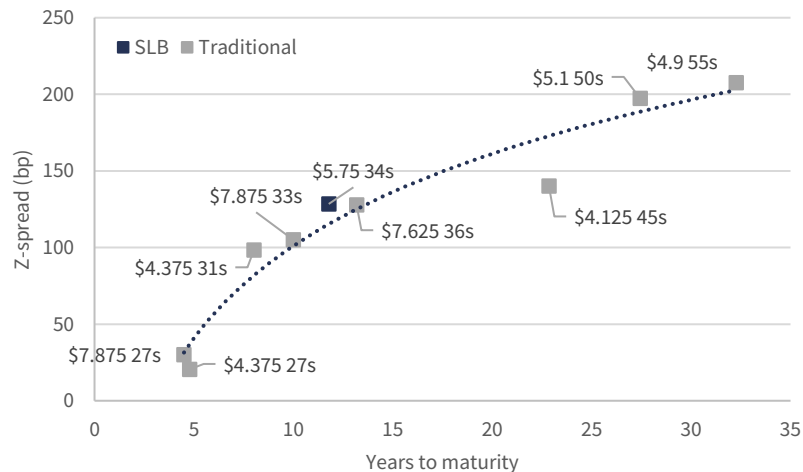
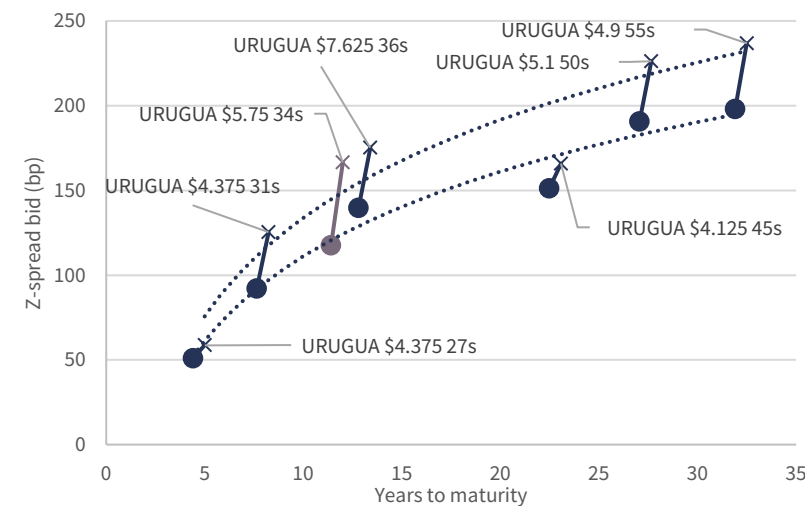


Figure 2. Uruguay USD bond spreads from 25 Oct 2022 (crosses) to 31 May 2023 (circles). Source: Bloomberg, accessed 31 May 2023.



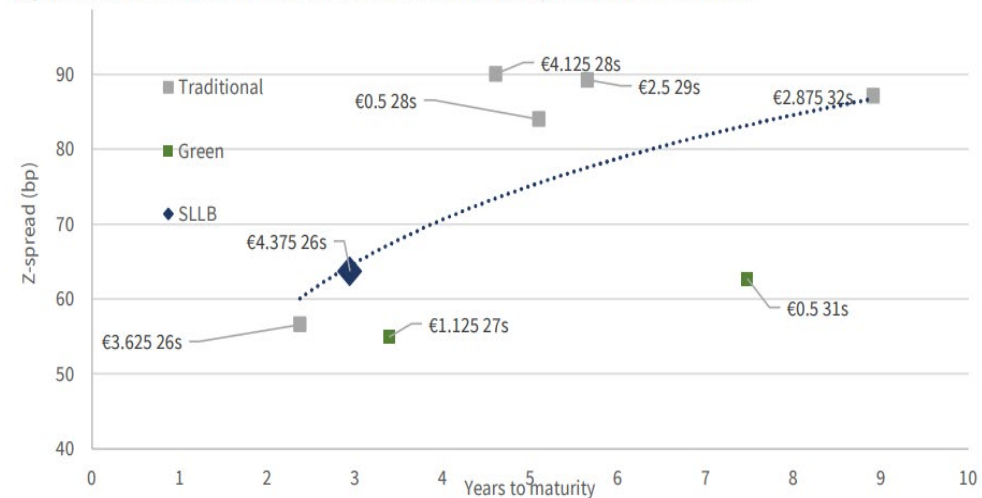
- Research: “[Understanding dynamics between sustainable and traditional debt](#)”, “[Uruguay SLB: market update](#)”

Case study: Nordea sustainability-linked loan bond

AN SLLB IS A USE-OF-PROCEEDS INSTRUMENT USED TO FUND SUSTAINABILITY-LINKED LOANS

- SEK2.8bn / NOK1.3bn issued in Sep 22
- EUR1bn issued in Aug 23
- Offers sustainability-linked exposure to FIG investors
- Introduces an external review to SLL
 - › SLLB was assessed by the same reviewer presenting a conflict
- Pricing seems unconvincing
 - › 8bp concession paid at issuance

Figure 1. Nordea EUR senior debt spreads. Source: Bloomberg, accessed 28 Sep 2023.



- Research: [“Nordea SLLB: driving for a sustainability-linked future”](#)

AFII resources on SLBs

PRICING, KPI SELECTION, DUE DILIGENCE AND INVESTOR IMPLEMENTATION

Option-based pricing of SLBs

[An option pricing approach for sustainability-linked bonds](#)
[Notes on risk-neutral pricing of SLBs and step-down structures](#)

Evaluation of KPI/SPT selection

[Le SLB d’Auchan, il change la vie?](#)
[Airport Sustainability-Linked Bonds: clear for takeoff](#)
[Chemical sector: synthesizing impact with SLBs](#)
[Offi-Chile the largest sovereign SLB Issuer](#)
[Deutsche Post SLB: does it deliver?](#)
[Uruguay SLB: market update](#)
[Carrefour: 1 SLB, 2 KPIs, 3 Scopes of emissions included](#)
[BHP: Think big with an SLB](#)
[Nissan: Shift expectations with an SLB?](#)
[Air France-KLM: Come fly with SLBs](#)

Webinars

Recordings available upon [request](#)

Sustainability linked bonds: A practitioner’s perspective. April 2022
 Technical webinar: An option pricing approach for sustainability-linked bonds. Nov 2022
 Technical webinar: Risk-neutral pricing of SLBs with applications to step-downs. Nov 2022

Risk management

[SLBs: no calamity](#)
[Sustainability-Linked Bonds: alternative steps](#)
[A review of SLBs approaching KPI observation dates](#)
[Understanding dynamics between sustainable and traditional debt](#)
[SLBs: complementary, my dear Investor](#)
[SLB triggers: What if Nobian or PPC miss their targets?](#)
[Enel – Market update on 2022 KPI observation](#)
[One small step for Orlen, one giant leap for the SLB market](#)

SLB due diligence

[The Forensic Carbon Accountant: JBS SLB](#)
[Nobian: a lot of hot air?](#)
[Sembcorp: “Carbon footprint arbitrage of a lifetime”](#)
[Enbridge oil sands SLB - participation trophy alert](#)
[Banks hit by ‘fraud’ complaint to SEC over Adani SLB coal links](#)

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