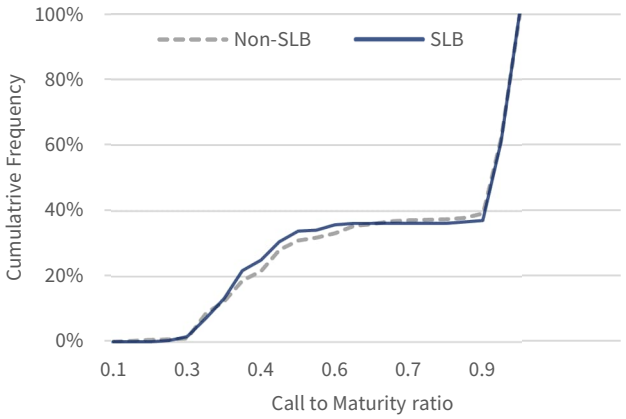
SLBs: no cal(l)amity

Kamesh Korangi[(*)], Ulf Erlandsson

A common criticism of sustainability-linked bonds (SLBs) has been around callability, where it is sometimes suggested that bond issuers are pushing this feature into bond structures to wriggle out of sustainability commitments. For example, a recent policy paper states, *"SLB […] call options are designed to potentially minimize penalties."*[1] Our analysis finds scant quantitative evidence to support this critique. Overall, when comparing SLBs with similar non-SLB issuances, we observe little 'excess' callability in SLBs. The key to this result is to control for sectors, ratings and issue age when comparing SLBs with the much larger market of traditional bonds. To summarise:

- **No material difference in the proportion of SLBs that are callable compared to similar bonds.** The increase of callability in the market, in general, may be a reason it has been perceived that newer vintage bonds, such as SLBs, have 'more' callability than older bonds. We do find increased callability in SLBs issued in 2021, but it seems exaggerated to extrapolate one year's pattern into general market dynamics.

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



- **SLBs' first call option dates align with the overall market**. As illustrated in Figure 1, the distribution of call dates relative to final maturities does not differ significantly between SLBs and comparable non-SLBs. SLB structures with calls before step-up dates seem to be idiosyncratic rather than systemic.
- **In current market conditions, the value of the call option in SLBs is relatively small, "out-of-the-money"[2].** With interest rates having risen substantially since the original time of issuance for most SLBs, the issuer cost of calling the bonds is materially higher than paying sustainability-related step-up coupons. It simply does not make sense economically to call most of the outstanding SLBs, and thus – from a practical standpoint - arguing that calls in SLBs are a big issue has little merit.

[1] "Structural Loopholes in Sustainability-Linked Bonds", Ul Haq and Doumbia, World Bank Policy Working Paper Series, 2022; "The Design Flaw in Sustainability-Linked Bonds", Lefournier, J., Chaire Énergie et Prospérité Working Paper, Jun 2023.

[2] "Out-of-the-money" is an option market term which applies when the option is unlikely to be exercised in present market conditions. For bonds with call options, this applies when the bonds are trading at a lower price than the call strike price.

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Introduction

Sustainability-linked bonds (SLBs) link issuers' sustainability targets to the cost of debt by varying the interest payments according to the achievement of pre-defined sustainability targets. They are structured potentially to reduce the cost of debt for firms or countries committed to sustainability, usually by offering a step-up coupon if emissions or other environmental and social factors are not improved. AFII has studied these structures in detail; see Appendix 1 for the research papers.

Previous studies have recommended science-based targets to achieve real, sustainable goals[3], and analysed both who captures the premium[4] and the economics of SLBs[5]. Few studies have focused on the call options in these bonds. Questions have been raised about the timing of call dates[6] and whether they are being used strategically to avoid step-ups.[7] These questions are linked with greenwashing concerns that are postulated as a potential reason for the slowdown in SLB issuance since 2022.[8]

This report focuses on this callability aspect of SLBs and conducts a comprehensive study on the relationship with other key aspects of the structure, such as the KPI observation period, step-up dates and maturity date, to assess the validity of these concerns.

Debt raised through bonds or loans in the capital markets often includes certain covenants. These function to define the rights of debt holders and avoid agency costs with management and shareholders. Restrictive covenants can be substantial in high-yield bonds compared to investment-grade bonds. As high-yield issuers have more credit risk, bondholders typically demand stronger protection through more restrictive covenants. These can take various forms such as restrictions on further leverage, limitations on asset sales, change of control protections, early redemptions and make-whole provisions.[9]

This paper will look at call options, also sometimes called early redemptions. These are a common feature in the bond market. They afford the issuer the right, but not the obligation, to buy back the bond on a pre-determined date at a pre-determined price or spread.

To address the criticism that SLBs are often callable to avoid paying a step-up coupon, we address the following three research questions:

- Are there more callable bonds among SLBs, and what is the composition of such bonds?
- Is there a systematic difference in calls when we compare SLBs with non-SLBs?
- How are the call dates for SLBs related to KPI observation and step-up dates?

We describe the data collection method next and look to address these questions with different visualisations and by quantifying the differences where possible. Finally, we offer our conclusions and the future scope of similar studies.

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[3] "Sustainability-Linked Bonds – Their Potential to Promote Issuers' Transition to Net-Zero Emissions and Future Research Directions", Gregor Vulturius et al., Journal of Sustainable Finance & Investment, Feb 2022.
[4] "Who Pays for Sustainability? An Analysis of Sustainability-Linked Bonds", Julian F. Kölbel and Adrien-Paul Lambillon, SSRN Scholarly Paper, Jan 2022.
[5] "The Economics of Sustainability Linked Bonds", Tony Berrada et al., SSRN Electronic Journal, 2022.
[6] "ESG-Linked Bonds With "Exit Clause" Raise Alarm in New Analysis", Bloomberg, Jul 2023.
[7] "Structural Loopholes in Sustainability-Linked Bonds", Ul Haq and Doumbia, SSRN, Oct 2022.
[8] "ESG-Linked Bonds Seen Stalling on Greenwash and Legal Fears", Bloomberg, Nov 2022.
[9] For an extensive discussion on the various shapes and forms of covenants, see Bernd Bohr, "High Yield Bonds An Issuer's Guide", Mayer Brown, 2020.

This paper does not discuss the other two main critiques of the SLB market: size and financial materiality of step-ups or step-downs, or the actual sustainability ambition in the targets. We discuss these critiques at length in other papers but would note that they represent calibration issues in SLBs rather than structural deficiencies.

Callability structures in the bond market

Callability comes in several different shapes and sizes in the bond market, and before specifically looking at SLB callability, it can be useful to understand the main form of calls:

- **Hybrid bonds**: hybrids are commonplace in the Utilities sector[10] and in other sectors such as financials where hybrids/AT1s feature. They are a way for corporates to issue subordinated capital. A common structure will be "Perp-nc-5", i.e., a perpetual bond but with a call after five years. Traditionally, the majority of those calls are executed, and thus priced to the first call date rather than to perpetuity.
- **Bank capital**: with the experience of a number of liquidity crises over the past two decades, regulators have been keen to see more flexibility in terms of banks' obligations to repay senior bonds, which has led to a large proportion of "11nc10" type of structures (reads "eleven-non-call-ten"). For practical purposes, investors will view such a bond as a 10yr bond but knowing that the bank could extend it up to one year if in need of liquidity. Further call structures are available down the capital structure.
- **General liquidity calls**: a trend has evolved over the past decade, emanating from the US, to set calls shortly prior to the maturity date of vanilla bonds, e.g., one- or three-month par calls. This, as we understand, is mainly an exercise of managing liquidity for a company: often a bond will have been refinanced 6-12 months prior to maturity, and one can argue that the issuer is then paying 'excess interest' if they are not able to place their excess liquidity at the same rates as they are paying on their bonds. Having an option to call the maturing bond a bit earlier is simply a way to be slightly more economical.[11] These types of calls are often referred to as "clean-up calls" and are very close to the bond maturity.
- **High-yield and crossover calls**: wider spread issuers, often companies owned by private-equity owners, will issue callable bonds, where the calls can be substantially inside the maturity date of the bonds. They have a structured call price, typically paying par plus half the coupon after half the term and decreasing the premium by half, yearly until par or maturity. They also have 10% call where the issuer can call 10% of the outstanding in a year. These are generally seen as options for issuers to refinance at more attractive rates if the underlying (high-risk) company has improved credit-wise. From this perspective, the economic incentives to call HY or crossover bonds may be quite substantial, if associated with improvement in credit spreads.

Most bonds also have make-whole provisions, which unlike a call option with a fixed price, is at a fixed spread over a benchmark bond, typically the closest government bond. This provision allows the issuer to retire their debt provided they compensate the investors. This lasts until the bond's call date. This is even more costly as the issuer redemption spread is tight to where the market

[10] This is also more common in the Telecoms sector, see "On the Pricing of Step-Up Bonds in the European Telecom Sector", Lando and Mortensen, SSRN, 2004.
[11] See, for example, "Three month par calls: a useful tool for senior issuance", GlobalCapital, May 2021.

spread would be and, if it is lower than par, the issuer needs to be paid back par. Studies show this too gets exercised more than thought despite the high financial costs.[12]

On SLBs, the make-whole provision gives the additional option to the issuer as the bond could be made-whole ahead of any thematic defaults around the fulfilment of the sustainability targets. The make-whole provisions are also at any time before the call. The sector has not had any such defaults yet but as the market matures these events could happen. It is very expensive for an issuer to exercise this option, much more expensive than the coupon step-up.[13] To understand the typical costs involved, we show a working example in Appendix 2.

This study seeks to understand if these issuer motivations are equally distributed between SLB and non-SLB issuances or if the SLB markets have a different distribution of calls and placement. A large sample of SLB and non-SLB bonds are collected to understand these issues and this method is explained next.

Creating an apples-for-apples SLB vs non-SLB sample

Given the volatile conditions of the bond market since the inaugural SLB was issued in 2019, there is a relatively short sample to create comparative metrics of SLB and non-SLB issuance. Naturally, the patterns, if any, in SLB issuance versus non-SLB has been variable over this short sample period.[14] Hence, we approach the issue of understanding differentials in callability by creating comparable bonds to individual SLBs. This allows us more specifically to ask questions such as "given this particular SLB, if we have similarly rated bonds, from the same sector, issued at roughly the same time, can we identify any differences in callability structures?"

To do this, we collected the data of all active SLB issues from Jan 2019 to Jun 2023, resulting in a universe of 846 bonds. Next, we identified a comparable non-SLB universe, using the Bloomberg COMB function, which identifies peer bonds based on duration, industry classification on a bond and issuer level, and other characteristics.

The COMB algorithm identifies peers over industry and issuer categories. For industry peers, it selects from specific to general industry-level matches, until a satisfactory number of peers is found. Depending on the issuer size, rating, and duration of the particular bond, it could identify between two to more than 20 bonds. To avoid selection bias, we randomly select a maximum of five peers in each industry and issuer group.[15] This left 4200 bonds in total.

As these were all related bonds, we removed the duplicates and filtered for non-SLB bonds. This reduced the comparable universe of bonds to 3219.

We had data reliability concerns about issuers that were not rated, as we found the data to be inconsistent. The amount outstanding was not in line with the issuance. Hence, we also removed

[12] "The Life Cycle of Make-Whole Call Provisions", Scott Brown and Eric Powers, Journal of Corporate Finance , Dec 2020.

[13] "SLB Triggers: What next If Nobian or PPC Miss Their Targets?", AFII, Feb 2023.

[14] "SLBs: complementary my dear Investor", AFII, Apr 2023, contains a broader discussion on the issuance patterns in SLBs. The study concludes among other things that SLBs are more frequently used in harder-to-transition industries, lower rated entities and Lat Am emerging markets.

[15] For SLBs with fewer than five peer bonds, we use all peers. Where there are more than five comparables, we use the random.sample function in Python, to select five.

these issuers from the SLB and non-SLB universe.[16] We filtered out any Government and Financials as these issuers belong to a different broad market.[17] In this study, we focus on corporate bond markets as they are a separate class, and most studies focus exclusively on these.

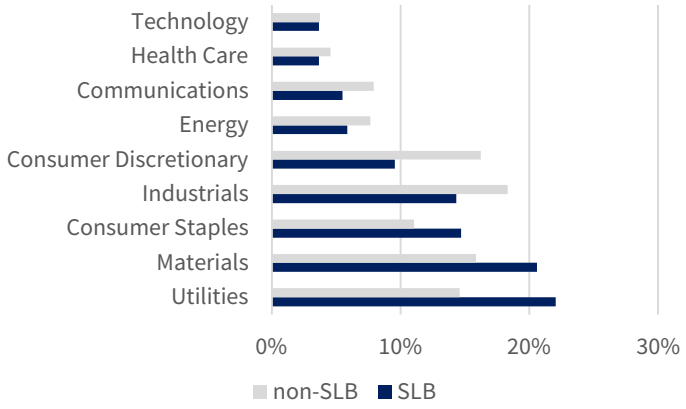
We then applied two further filters. First, only EUR and USD issues are considered, as these are the largest debt markets and as such represent the quantum of SLBs and have better transparency in terms of observation and call dates. This is currency rather than issuer specific: we include all international issuers who raise debt in these two currencies. We use this set to report the issuance and call analysis by vintage.

Table 1: Count of SLBs and non-SLBs issued (% of category issuance by amount) by rating in the benchmark sample. Last row showing total count of bonds (amount issued) in the category

	non-SLB		SLB	
Rating	EUR	USD	EUR	USD
AA	32 (7%)	8 (2%)	3 (4%)	0 (0%)
A	169 (28%)	62 (14%)	15 (12%)	11 (9%)
BBB	260 (40%)	155 (34%)	71 (53%)	63 (52%)
BB	106 (14%)	138 (36%)	23 (17%)	39 (27%)
B	88 (11%)	58 (12%)	20 (11%)	19 (11%)
CCC and below	5 (1%)	15 (3%)	6 (3%)	2 (2%)
Total	660 (445)	436 (356)	138 (92)	134 (105)

Second, we limit the initial outstanding amount to greater than $300mm in either of these currencies as these are bonds that could be traded in meaningful lots and the price histories are more reliable.

Figure 2: Industry composition of SLBs and non-SLBs



This data processing results in a final universe of 1368 bonds of which 272 are SLBs and rest are non-SLBs. The number of bonds by type and currency is shown in Table 1, also illustrating the rating composition of all rated bonds in this sample. SLBs have lower issuance at single A or above credit ratings compared to non-SLBs. Figure 2 shows the industry composition of firms in the SLB and non-SLB universe. The size of the markets is also very different; SLBs are a small part of the larger bond market. We avoid filtering of any bonds by credit risk criteria such as ratings or sector levels as this would bias the dataset and the conclusions are not generalisable. Instead, we statistically test the significance of such differences given the discrete characteristics of SLB and non-SLB universes. To our knowledge, this still represents of the largest datasets yet studied for SLBs.

[16] This had a bigger impact on the SLB universe, as 98% of such SLB bonds were not callable and they represented 35% of the amount outstanding according to Bloomberg.

[17] In Financials, 18 SLBs were removed. The COMB algorithm also identifies peers from wider industry, especially Financials, if it doesn't find enough matching peers for a given bond. For the unrated SLBs, it generated mostly Financials (501 bonds), both of which are filtered out. Five Government bond peers were found, which are also out of the sample. Government bonds have different credit criteria and deal sizes which will skew the studies. We did a test including these, and the results were even stronger, with reduced callability in SLBs.

Issuance patterns since the start of the SLB market

First, we look to understand any potential SLB market underperformance in terms of issuance in 2022. This is a relative exercise that must be undertaken with a comparable non-SLB market. We further divide the data into credit grades for a more detailed understanding.

Figure 3. SLB and non-SLB issuance in billions by credit grade

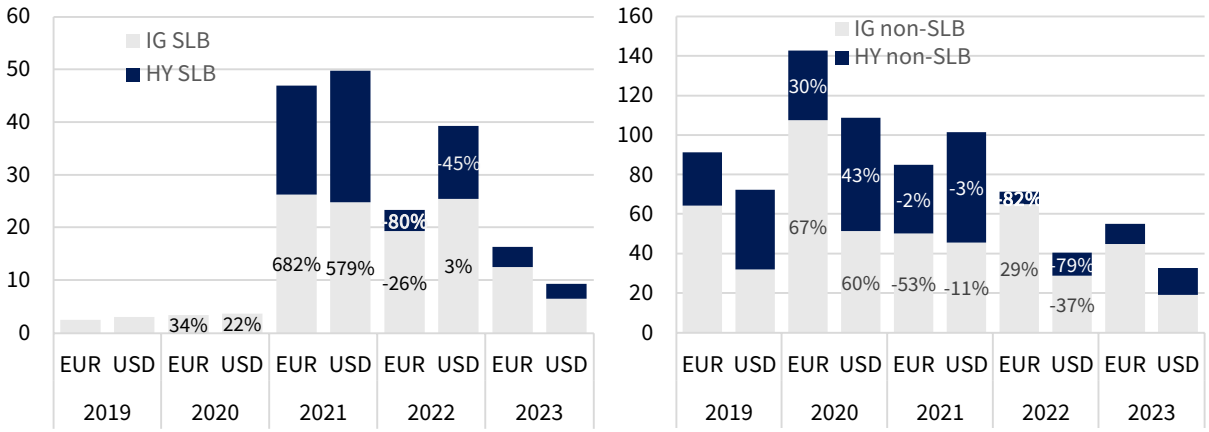


Figure 3 shows the total benchmark (defined as over $300mm size) issuance from SLBs on the left and non-SLBs on the right from 2019 to Jun 2023. Labels show YoY change for each category and currency. The most meaningful comparison would be between 2021 and 2022, as the pandemic impacted the year before, and SLBs were just getting started in 2019.

2022 was a year of heavily reduced primary market bond issuance, with rates rising and a negative risk backdrop (e.g., the S&P500 was down 20% in the year). Non-SLB USD issuance dropped by 37%, while SLB USD issuance showed slight growth of 3%, which is a strong relative number. European equity markets outperformed in 2022 with fewer technology sector valuation concerns and showed a similar outperformance in debt issuance – up 29% in the investment grade (IG) sector - while European IG SLB issuance was down 26%. In high-yield, there were similar drops in the EUR market where issuance was down 80% in SLBs and 82% in non-SLBs. High-yield is a relatively bigger portion of the SLB market than non-SLBs where IG issuance is much larger. This overall drop shows the risk averse nature of the market during that year.

At first glance, SLB issuance looks to have dropped significantly in 2022. By putting those numbers in a wider market context and comparing across different credit grades and currencies, the situation is not so clear cut. SLBs actually grew in the USD IG market while EUR IG issuance underperformed.

In conclusion, we need to look at market conditions to understand callability, not look at this feature in isolation. Issuance volumes – and hypothetically issuance patterns – change over time and bond vintages. The varying nature of interest rates from 2021 to 2022-23 will have impacted issuer decisions on including callability – regardless of sustainability criteria. If markets are weak (higher rates and lower equity), issuer-friendly protections like callability could be impacted.

Callability of SLBs compared with traditional issuance

Out of 1368 bonds in our analysis as outlined in the Creating an apples-for-apples SLB vs non-SLB sample section, 93% of SLBs and s and 87% of non-SLBs have calls. We look in detail at this callability over vintages, credit grades and distribution to understand any systematic differences.

Callability by issuance years/vintages

As one might expect, total bond market issuance varies between bull and bear market years. We are interested to see whether there is a difference in the proportion of callable bonds issued over time and how SLBs and non-SLBs compare.

Figure 4 shows the proportion of callable vs. non-callable bonds issued across 2019-2023 vintages. This chart's clear and fundamental point is that yes, there is a high proportion of SLBs with callability, but this is also the case in other bonds and markets. In 2023, over 86% of all bonds in the sample have some form of callability. We believe this is an important point, as SLB observers may not have been aware of how prevalent callability has become throughout the bond market.[18]

The second point to be taken away from Figure 4 is that **callability patterns in SLBs and non-SLBs only look different in 2021.** We use a pooled Z-score test statistic to understand the differences in the proportion of callability.[19] A Z-score represents how much a sample's value is different from the group value – in this case SLBs vs. non-SLBs. It is measured as the number of standard errors the value is away from the group value – here, the proportion of bonds that are callable. A Z-score of 0 would mean that the SLBs score the same as the group mean value.

Figure 4 shows the lower and upper range of the test scores. If the Z-score between the callability proportion of SLBs and non-SLBs is within this range, they display no material difference. The dots are the calculated Z-score for a given year and give the same value for both categories, making it visually easier to understand.

2021 is the outlier, when the SLB market had 98% of bonds being callable while the comparative non-SLBs were 90%, giving a Z-score of 3.06. Looking at the more mature SLB years, 2022-23, this difference is lowered and even turned around for YTD 2023 issuance. This is reflected in Z-scores closer to 0.

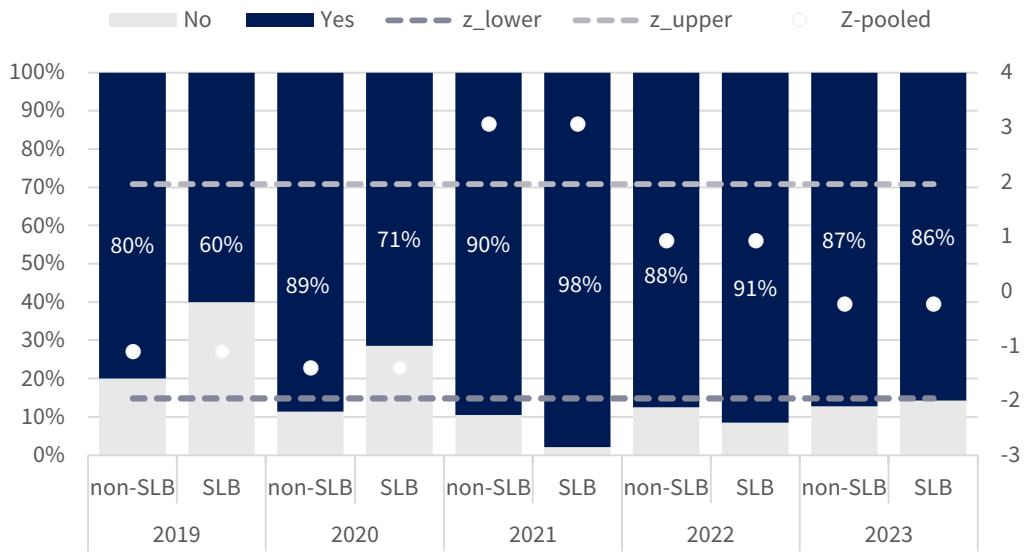
So if we look to the early SLB years of 2019-20, SLBs were less likely to have callability included compared to non-SLBs. This is intuitive: **as the market first developed, bonds were structured to have as few extra features as possible, with the focus being on the step structures themselves. As the SLB market matured, it started to converge with standard bond structures.**

In conclusion, in 2021 we see evidence of increased callability for SLBs, but no statistical difference for other vintages.

[18] For a more wider discussion on call options in bond markets please see "Kicking Maturity Down the Road: Early Refinancing and Maturity Management in the Corporate Bond Market", Xu, Qiping, The Review of Financial Studies, Aug 2018.

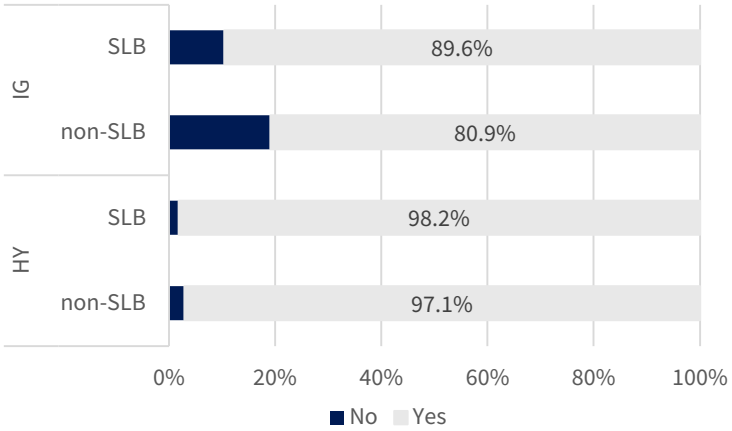
[19] See "Introductory Statistics", Barbara Illowsky and Susan Dean, 2018.

Figure 4: SLB and non-SLB callability per vintage, 2019-2023 YTD. Based on AFII SLB and non-SLB comp universe. Source: Bloomberg, AFII.



Credit quality/ratings and callability differences

Figure 5: Callability by credit grade of SLBs and non-SLBs

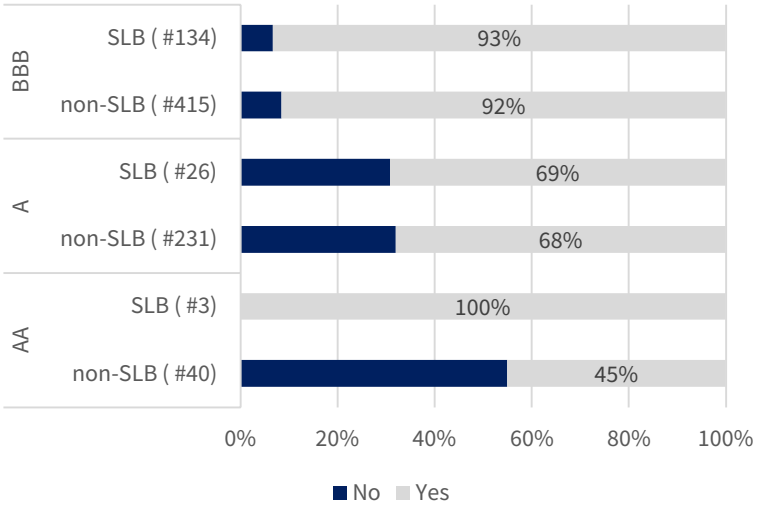


Next, we compare SLBs and non-SLBs callability by credit grades. Figure 5 shows the proportion of bonds issued along the credit risk dimension in the broad Investment Grade (IG) and High-Yield (HY) categories. In HY markets, SLBs and non-SLBs are similar, with over 97% of the bonds having a call option. As noted earlier in the Introduction, this is a feature of the HY market as issuers are smaller than IG issuers and would want the flexibility to call debt if the market improves or any M&A situation occurs.

In the IG market, we see a marked difference with 89.6% of SLBs having calls compared to the non-SLBs with 81%. This could lend support to the view that SLBs have more calls (in IG) versus non-SLBs.

Figure 6 shows a further breakdown of the IG ratings. The number of bonds involved in each classification is also shown. There are 26 SLBs in A category with 69% of these bonds being callable, compared to 231 in non-SLBs in the same category. Also, 82% of SLBs have BBB rating which has 93% callability. Similar non-SLBs are only 60% of their distribution but have similar callability at 92%. The main difference is driven by AA SLBs. There are however only three AA SLBs, making the sample too small for comment. All three bonds have calls within three months to maturity, showing they are liquidity calls. Such small samples can sometimes find differences that cannot necessarily be generalised to the full market. From a market perspective, this does not look like meaningful additional callability.

Figure 6: IG credit drill down for SLBs and non-SLBs



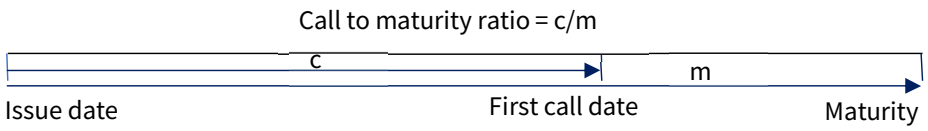
To summarise, we observe a higher instance of callability amongst IG SLBs compared to non-SLBs. Further analysis showed the variance in call distribution with more BBB weighting for SLBs. Controlling for credit rating, there is no difference. Only a small number of bonds in the AA bucket show different callability proportions, and these were all liquidity calls. **Hence, we conclude there is no systematic difference in callability proportion among SLBs and non SLBs with comparable credit ratings.**

Call dates: how far ahead of ultimate maturities

In this section, we look to answer two questions. First, are call date placements systematically different in SLBs compared to non-SLBs? Second, specifically for SLBs, what are the relationships between call dates, step-up dates, and KPI observation dates? To answer the first question, we define a new variable, call-to-maturity ratio. It is the ratio between the period from the issue date of a bond to its first call date and maturity, as shown in Figure 7.

For non-callable bonds, we define this value as one and exclude them from analysis. We also exclude maturities with less than one year and more than 30 years (mostly Perps which have no fixed maturity as defined in the Introduction).[20] This sample has 909 non-SLBs and 249 SLBs.

Figure 7: Call-to-maturity ratio of a bond.



[20] Over 30 years is a very long period to price call options. We also need to have fixed maturity date for this analysis so had to remove Perps that don't have a fixed maturity.

Figure 8. SLB and non-SLB call dates as a fraction of the total maturity. A high number/fraction indicates a call date close to the maturity date. Source: Bloomberg, AFII.

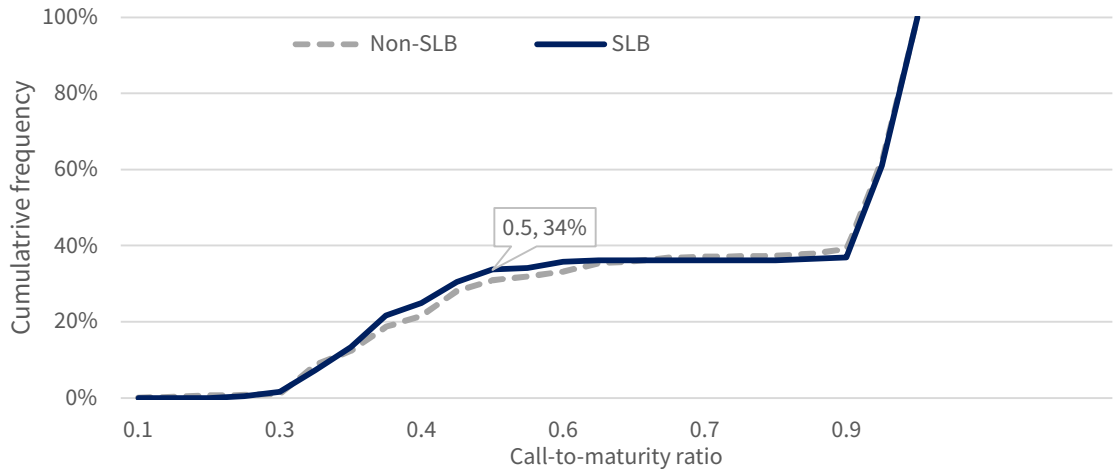


Figure 8 shows the plots of the cumulative distribution of SLBs and non-SLBs call-to-maturity ratio. It shows that 34% of SLBs have a call date at less than half of the maturity. We see over 60% of bonds have calls that are close to maturity, which as we discussed earlier, are a common feature to manage liquidity. Visually, the distributions look similar with SLBs having more short-dated calls, with the SLB line above the dotted non-SLB line in the range 0.4-0.6 call-to-maturity ratios. It seems a relatively small difference and we need to determine whether such difference is significant or not. For this we perform a statistical test if both the samples from SLBs and non-SLBs are from the same distribution using the Kolmogorov-Smirnov (KS) test. It has been widely used in the literature for similar problem settings.[21]

Table 2: Testing if SLB and non-SLB call date distributions are similar.[22]

Results	value
KS statistic	0.083
p-value	0.127
Statistic-location	0.976
Statistic-sign	-1

For the two cumulative distributions, the test finds the largest absolute difference between them and use that quantity as a test statistic. The results are shown in Table 2. The maximum difference was 8.3% at the call-maturity ratio of 0.971, at liquidity call end. The null hypothesis that they are from the same distribution cannot be rejected at a 0.05 threshold level as the reported p-value is 0.127. The result shows no systematic difference between the placement of call dates for SLBs and non-SLBs. However, these could change with different data settings as there is a weak case for an alternative if we relax our threshold levels from the normal 0.05 level.[22] **Therefore, our conclusion is that call dates relative to bond maturities are not materially different between SLBs and non-SLBs.**

Next, we address the second question. The real concern in the market has been for SLBs with call dates prior to actual coupon step dates. So far, systematic data on step-up dates is only available

[21] "Kolmogorov–Smirnov Test: Overview", Vance W. Berger and YanYan Zhou, John Wiley & Sons Ltd, 2014

[22] We performed the same KS test, without the clean-up calls, by filtering out bonds with a call-to-maturity ratio greater than 0.89. This removed 60% of the sample. The p-value was even higher at 0.227, with the KS statistic at 12% and the location at 0.43 call-to-maturity ratio. This supports earlier results on the larger sample.

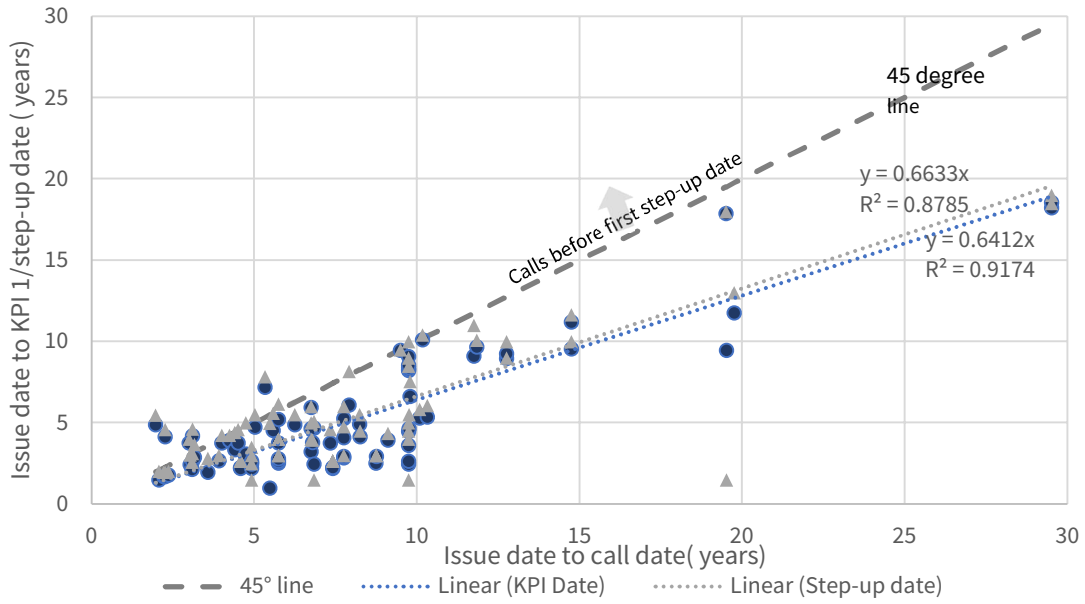
in bespoke datasets. In Figure 9, we review call dates vs. KPI observation dates on several SLBs in the AFII database.[23]

The scatter plot has the X-axis from the issue date to the first call date and the Y-axis from the issue to the first KPI observation date. We filter out observation dates in the next year.

We find a strong linear relationship and that call dates are much later to the observation dates or the step-up dates. The blue dotted line shows this relationship with call dates and observation dates with the goodness-of-fit measure at 0.971. The grey dotted line shows a similar relation to the actual step-up dates and call dates. The step-ups precede the call and are only slightly closer to call dates than observation dates. This is expected as the step-up dates can only be possible after observing and ratifying the KPI. **Given call dates are usually after the step-up dates, it is hard to argue they are used to evade having to go through the sustainability-performance test.[24]**

These results indicate that call date placements are not systematically different in SLB and non-SLB markets. **The conclusion is that the call dates are not typically in the mind of issuers when deciding the placement of KPI dates and observation dates**. Embedded call options in bonds play an important role in debt markets as outlined in the Introduction. They are mainly for liquidity management around time of maturity and for riskier credits to take advantage of market conditions or underlying business improvements. With SLB issuers, the added concerns of KPI dates and step-up make them look related when they are not.

Figure 9 : Call-to-KPI observation date, step-up dates. Source: AFII.



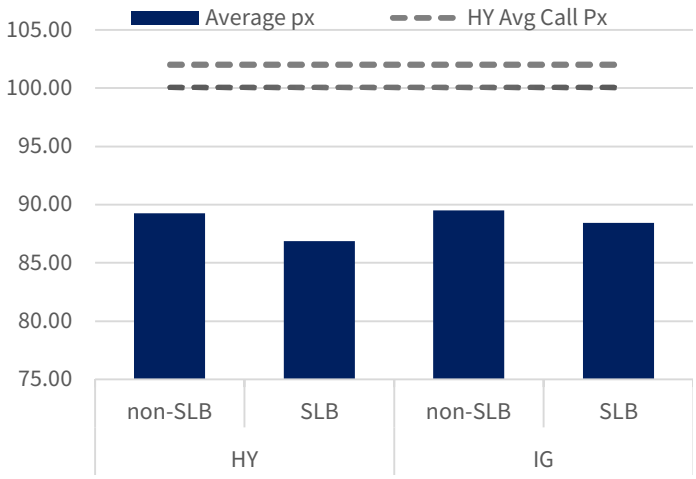
[23] This is a bespoke database on SLBs populated with more granular information on KPIs and other terms of SLBs. It currently covers over 400 SLBs in general, and 100+ in terms of the most specific data and analysis. Applying other filters reported earlier, this sample is of 80 bonds. We believe this is a representative – if small – sample and will return to this analysis as the database gets further populated. SLB documentation is not always straightforward in terms of providing exact SPT and observation date information.

[24] A call date prior to the sustainability-performance test date would imply that the issuer could almost fully disregard the sustainability targets, whereas calls after the SPT test date would incur both economic costs (higher coupon payments) as well as the reputational cost of having failed a target, making the targets still relevant. These two cases are represented by the sets above/below the 45 degree line in the Figure.

Calling bonds in a high(er) interest rate market

Market price plays a significant role in the valuation of call options. The interaction between the default risk of a bond with call options and stochastic interest rates is well studied.[25] In a rising rate environment, it is highly unlikely that bonds issued in a market where rates were lower will be called, if other factors remain the same. A significant event, such as an M&A situation, could be a circumstance in which the option may be exercised.

Figure 10: Market price of SLBs and Non-SLBs vs. average call price levels. Source: Bloomberg, AFII.



To further understand the likelihood of a call being exercised, Figure 10 shows the average trading price of SLBs and non-SLBs. The grey dashed lines show average call price for HY (price of 102) and IG bonds (price of 100). We note the higher premium in the calls embedded in HY bonds, which is structurally driven due to the call schedules. The averages could be misleading but still give a good indication of where the markets stand. Call prices are fixed, so we compare the current prices to the call.

The HY SLBs are trading between 85 to 90. If an average SLB bond trading at 87 is called at 102, this represents a 15% cost. When 50bps is considered material in the market (a typical step-up is 25bps and a period of 5 years of step-ups represents 2.5% cost without discounting), a 15% cost seems unlikely to be acceptable. It will be a significant cost to any issuer especially those with limited flexibility to call bonds in the intermediate term unless interest rates move down drastically. We can safely speculate that, on average, few call options will be exercised. **Specifically, with SLBs, the cost of step-ups on a bond price basis is only a small fraction of exercising the call option, which will be at a significant cost in the current market.**

In the event that SLBs are structured with more material step-ups, and a rate rally moves calls closer to At-The-Money (ATM),[26] it is possible that calls could be exercised more frequently among SLBs than non-SLBs. Clearly, to repeat the message of Figure 10, we are far away from this scenario at the moment,[27] and would expect investors to adjust their pricing views and models accordingly.[28]

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[25] "Corporate Bond Valuation and Hedging with Stochastic Interest Rates and Endogenous Bankruptcy", Viral V. Acharya and Jennifer N. Carpenter, The Review of Financial Studies, Oct 2002.

[26] "At-the-money" is another option market term where the option is likely to be exercised in present market conditions. For bonds with call options, it is when the bonds are trading closer to the call strike price.

[27] A recent discussion around the non-attractiveness of calling bonds in this market can be found in "Companies Face Hybrid Bond Dilemma: Refinance or Ditch the Debt", Bloomberg, 30 Aug 2023, discussing how expensive it is for hybrid bond issuers to call bonds at the first date, making some issuers considering alternative in the face of well-cemented investor expectations (of calls to happen).

[28] For example, many investors use option-adjusted spread (OAS) spread metrics rather than z-spreads to price bonds in spread terms when there are embedded options in the structures. A future research area would be to implement an OAS pricing model for SLBs.

Conclusions

This paper has conducted several analyses seeking to establish if there is "excess" callability in SLBs compared to traditional bonds. At the core of these quantitative investigations has been a dataset generated using a third-party algorithm for selecting comparable traditional bonds to the individual SLBs.

We compare this sampled dataset across a few dimensions:

- **Year issued (vintage):** comparing older bonds with newer bonds could create biases, if there is time variation in callability – as we argue there is. When we compare SLB vs. non-SLB callability across different years, we only find a significantly higher callability in SLBs in 2021.
- **Credit quality/rating:** callability traditionally varies depending upon credit quality, and earlier studies have shown SLBs to be a preferred issuance form for higher yielding credits than, for example, green bonds. Our results reflect this: we find substantially higher callability ratios for HY bonds, but no difference in callability between SLBs and non-SLBs once we have normalised for rating.
- **Call date timing:** the main critique against SLB callability has been if calls are prior to the sustainability performance target observation dates. We find very few instances where this happens in our dataset, and on an aggregate level, SLB call dates seem distributed in terms of time before maturity very similar to traditional bonds.

Furthermore, we discuss the economics of calling bonds, and argue that the financial incentive to call an SLB (in terms of coupon step-up avoidance), is not compelling in the current market environment. This may of course change over time but should not be a concern today.

This leads us to suggest that callability in SLBs may be an idiosyncratic issue and a valid critique of some specific issuances, but should not be seen as a major flaw in the structure per se. Indeed, this analysis strengthens our conviction that fixed income investors would not be buying structures with 'loopholes' to their economic detriment.

In fact, we argue here and in previous work that the SLB's structural features are favourable for both investors and issuers. As data quality improves on emissions and other ESG targets, SLBs will become increasingly valuable instruments for financing sustainable transitions across multiple sectors, offering an improved cost of capital for ambitious issuers.

The SLB area remains rich in terms of future research potential.

On the technical side, we have pointed to the usefulness of deploying OAS pricing models to accommodate exactly the embedded options (calls) that this study has analysed. Capital structure questions remain open: what happens when a company's debt structure is X% SLB and 100%-X% standard bond such that the SLBs give a halo effect to the non-SLBs?

The capital structure question should also be applied to a more macro level: what happens when a significant proportion of the bond market is allocated to SLBs in terms of real-world impact and carbon emissions reductions? What is the basic correlation between sustainability targets and creditworthiness?

We look to address these questions in future papers.

Appendix 1 – AFII SLB references

AFII Research Title	Publication date
SLB thematic research	
SLBs: no cal(l)amity	Sep 2023
Sustainability-Linked Bonds: alternative steps	May 2023
Greenback SLBs: an impact standardisation proposal"	May 2023
SLBs: complementary my dear Investor	Apr 2023
Understanding dynamics between sustainable and traditional debt	Jan 2023
An option pricing approach for Sustainability-Linked Bonds	Nov 2022
Notes on Risk-Neutral Pricing of SLBs and Step-down Structures	Oct 2022
Sovereign, sector or company specific SLB Research	
The Forensic Carbon Accountant: JBS SLB	Sep 2023
Sustainability-Linked Bond Bumper Week	Sep 2023
Airport SLBs: clear for takeoff	Jul 2023
Chemicals sector: synthesising impact with SLBs	Jul 2023
Offi-Chile the largest sovereign SLB issuer	Jun 2023
Deutsche Post SLB: does it deliver?	Jun 2023
Sovereign SLB: an option for Japan's transition	Jun 2023
Carrefour SLB: market update	Jun 2023
Uruguay SLB: market update	Jun 2023
Nobian SLB: a lot of hot air?	May 2023
Carrefour: 1 SLB, 2 KPIs,3 Scopes of emissions included	May 2023
SLB triggers: what next if Nobian or PPC miss their targets	Feb 2023
BHP: think big with an SLB	Feb 2023
Enel-Market update on 2022 KPI observation	Feb 2023
Nissan: shift expectations with an SLB?	Feb 2023
Air France-KLM: Come fly with SLBs	Jan 2023
One small step for Orlen, one giant leap for the SLB market	Nov 2022
A review of SLBs approaching KPI observation dates	Nov 2022
Sembcorp: "Carbon footprint arbitrage of a lifetime"	Nov 2022
JBS: A meaty SLB impact proposal	Aug 2022
Enel: A case study in transition finance using SLBs	Jul 2022
SLB bond radar: Eni (potentially) coming to market	Jul 2022
Chile sustainability-linked bond: Optionality analysis	Apr 2022
Adani and what could be the world's coolest SLB	Jul 2021
Enbridge oil sands SLB - participation trophy alert	Jun 2021

Appendix 2 – An example make-whole callable bond

Figure 4 shows a Glencore bond issued in 2021 with some callability features.

- "Make-whole @ 20"
- "Call 12/01/28@100" is a call one year ahead of the maturity date.

The make-whole provision in the prospectus and the final terms are in Figure 5; the calculation is shown afterwards.

Figure 11. GLENLN €0.75 03/29 bond (ISIN XS2307764238). Source: Bloomberg.

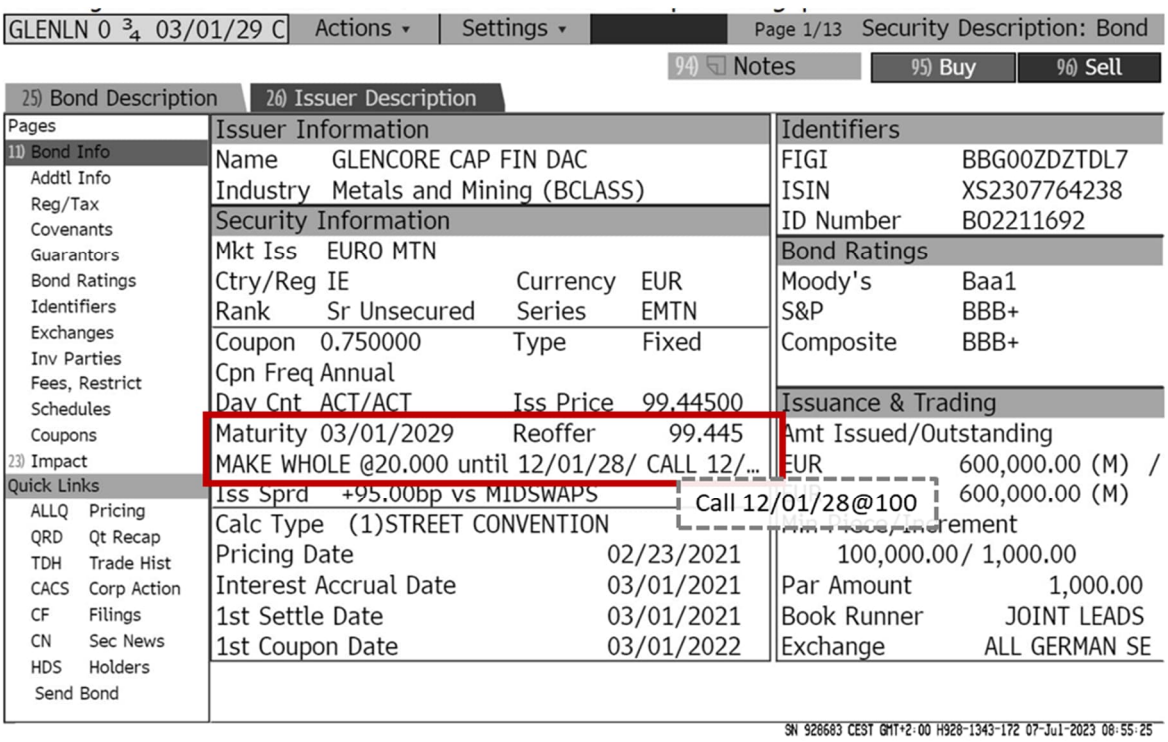


Figure 12: Make-whole provision in Prospectus(left) and Final terms(right)

If Make-whole Amount is specified in the relevant Final Terms as the Optional Redemption Amount (Call), the Optional Redemption Amount (Call) per Note shall be equal to the higher of the following, in each case together with interest accrued to but excluding the Optional Redemption Date(s) (Call):

(i) the principal amount of the Note; and

(ii) the principal amount of the Note multiplied by the price (as reported in writing to the Issuer and the Trustee by a Financial Adviser) expressed as a percentage at which the Gross Redemption Yield on the Notes on the Determination Date is equal to the Gross Redemption Yield at the Quotation Time on the Determination Date of the Reference Bond (or, where the Financial Adviser advises the Issuer that, for reasons of illiquidity or otherwise, such Reference Bond is not appropriate for such purpose, such other government stock as such Financial Adviser may recommend) plus any applicable Redemption Margin.

Optional Redemption Amount(s) of each Note:	(1) *Issuer Call at Par*: EUR 1,000 per Calculation Amount
	(2) *Issuer Call at Make-whole Amount*: Make-whole Amount:
	(A) Reference Bond: DBR 0.250% 15/02/29
	(B) Quotation Time: 11:00 a.m. CET
	(C) Redemption Margin: +0.20 per cent.

Table 2 provides the make-whole calculation. The current column uses the spread that is most recent. For the make-whole price, the input spread is 20bps. The make-whole can be done before 01/12/2028, so we have a work-out date one day before that and it can be called after that at a fixed price of 100, which is the last column. Using the years remaining from now to the workout day, we calculate the net present value (NPV) of the coupon and the price, which is 89.60 for make-whole. This price turns out to be lower than par, and as per the provisions shown in Figure 5, it should be the higher price or the principal amount, which is a face value of 100. The final price will also include accrued interest until the settlement date.

Table 3: Make-whole price calculation.

Name	**GLENLN 0 ¾ 03/01/29 Corp**		
Face Value	100		
Coupon	0.75%		
Reference bond	DBR 0.250% 15/02/29		
Yield of Ref bond	2.66%		
Calculation date	12/07/2023		
	Current	Make-whole	Call
Input Spread	2.0%	0.2%	
Workout Date	01/03/2029	30/11/2028	01/12/2028
Period (years)	5.64	5.39	5.39
Coupon NPV	3.64	3.70	
Price	81.00	89.60	100.00

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