Scope Covered Bond Rating Methodology

Financial Institutions/ Structured Finance

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This is the fourth annual update of the Covered Bond Rating Methodology. The update introduces the ability to incorporated ESG considerations into the covered bond analysis and highlights that the agency uses a proprietary covered bond expected loss model (CobEL). Additional changes enhance transparency and readability.

1 Areas of application

The methodology applies to all covered bonds that benefit from a dual recourse to both a financial institution and a ring-fenced cover pool. A financial institution is responsible for the timely and full payment of interest and principal (first recourse). In contrast to other parts of a bank's liability structure, covered bonds are excluded from and hence protected against an issuer's restructuring or resolution, which is the envisaged rescue mechanism for a bank in distress. The need to rely on the cover pool (second recourse) and a potential loss will only arise if: i) early supervisory intervention has not helped to stabilise the bank; ii) regulatory capital is fully depleted and significant amounts of bail-inable debt are converted into capital to ensure that the issuer's business continues; and iii) the restructured or resolved bank becomes insolvent.

The methodology should be read in conjunction with other methodologies such as the General Structured Finance Methodology or other relevant methodologies when needed[1]. This methodology can also be applied to non-European covered bonds.

2 Summary

The methodology provides the framework for the rating assessment and regular monitoring of covered bonds. We apply the rating approach across markets to ensure comparability and consistency but will also incorporate credit-relevant issuer and jurisdiction-specific features. The rating methodology reflects that a scenario in which an insolvent issuer would rely solely on a cover pool for repayments has become extremely remote. Our covered bond methodology includes the following analytical steps:

A. The analysis of the issuer provides the bank rating, which is the anchor point for an additional rating uplift. The bank's rating expresses our view on the likelihood of a regulatory action on the issuer, which is the typical default-like scenario for a bank.

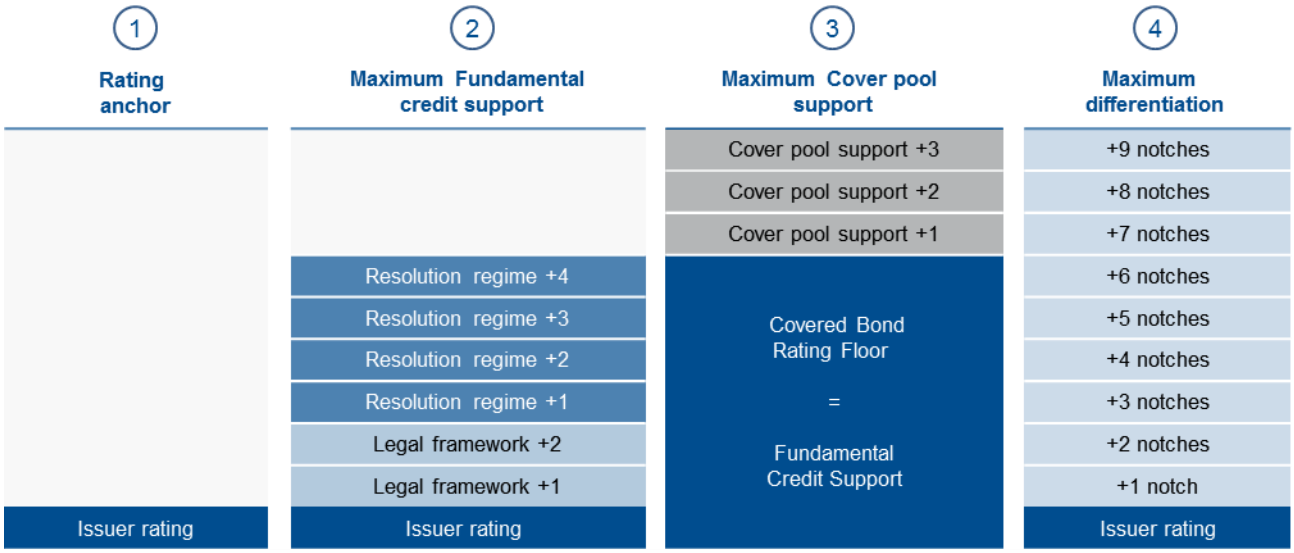
B. Fundamental credit support reflects how legal and resolution frameworks, including systemic importance considerations, increase the likelihood that a covered bond remains a going-concern funding instrument. A covered bond can represent a credit enhancement of up to six notches above the bank's issuer rating, reflecting the higher going-concern likelihood of covered bonds, even upon a regulatory intervention in its issuer.

C. Cover pool support reflects the benefits of the second recourse to the cover pool, if needed. The cover pool analysis establishes the risk of non-payment on the part of the issuer, the risk of insufficient flows stemming from the cover pool, and the associated expected loss. A loss can only arise if the following two conditions are met in this order: i) the issuer is in default; and ii) the covered bond structure cannot support full and timely repayment on its own. For highly rated issuers active in countries where fundamental support already allows the highest ratings, we may perform the cover pool analysis only to support the stability of the rating.

The management of cover pool risks and their mitigants is subject to management discretion, despite the general limitations stipulated in the respective covered bond framework. Cover pool support can fluctuate over time in the absence of firm and legally binding covenants. As a result, we generally limit additional credit differentiation stemming from cover pool support at up to three notches above the fundamental credit support.

[1] Other relevant methodological considerations include our Bank Rating Methodology, public finance methodologies and other methodologies that help to determine inputs into the asset credit risk or structural analysis of a covered bond programme. Our methodologies are available on www.scoperatings.com.

Figure 1. Building blocks of Scope's covered bond methodology



If cover pool support is a rating driver or fundamental credit support does not support the highest rating, we perform a detailed cover pool analysis; otherwise, a limited

Source: Scope Ratings

We highlight the following specific considerations:

- **Higher cover pool support.** Covered bond ratings may at times exceed the issuer rating by more than nine notches. We will increase the uplift if the issuer's influence on a covered bond's risk and refinancing structure is mitigated with features similar to those of a structured finance transaction[2]. A likely example would be covered bonds that become pass-through after meeting certain criteria and have: i) tight replenishment criteria; ii) further limitations at the issuer management's discretion; and iii) dynamic, committed overcollateralisation. The highest achievable covered bond rating will be the same as for a securitisation with similar asset risk and structural characteristics in the same country.
- **Cover pool support is a rating driver.** We will perform a detailed cover pool analysis for covered bond programmes which do not reach the highest rating (AAA) based solely on fundamental credit support. We assess: i) the cover pool's assets and cash flow on a quantitative basis; ii) issuer efforts to consistently manage risks prudently; and iii) the issuer's ongoing willingness and ability to provide enough overcollateralisation to mitigate these risks.
- **Cover pool support is not a rating driver.** Covered bond ratings for highly rated banks primarily reflect the fundamental credit support provided by legal and regulatory frameworks applicable to banks and their covered bonds. Fundamental credit support alone can result in the highest rating (AAA) if the issuer rating is sufficiently high. In this case, cover pool support is not a rating driver. Therefore, the quantitative analysis of the cover pool will be limited[3] and performed only to assess the likely stability of the covered bond rating.

An issuer downgrade could make a fundamental support-based rating reliant on cover pool support. We will request cover pool information from the issuer if the detailed cover pool analysis reveals that public information is insufficient to maintain the rating, e.g. due to a high share of private placements for which terms and conditions are not public. If such additional information cannot be readily obtained nor substituted with expert assumptions, we may withdraw the covered bond ratings of that issuer, in line with our policies[4]. Both limited and detailed cover pool analyses factor in dependencies on key counterparties, access to and protection of liquidity after issuer default, as well as the assessment of the relevant sovereign's credit fundamentals and their potential impact on the cover pool analysis.

[2] For covered bonds, those are referred to as conditional pass-through (CPT) structures.
[3] The limited cover pool analysis is generally based on public information. See Appendix IV for further details.
[4] See Scope's Rating Governance Policy available on www.scoperatings.com.

3 Fundamental credit support analysis

The fundamental credit support analysis comprises two areas: i) the legal framework; and ii) the resolution regime and systemic importance.

The legal framework analysis covers relevant aspects before and after an issuer's insolvency. It provides credit differentiation based on the clarity of provisions behind the ongoing maintenance of a high-credit-quality cover pool, as well as when the cover pool is the sole source of repayment for a covered bond.

The analysis of the resolution regime and systemic importance addresses whether: i) the issuer's balance sheet and capital structure allow regulators to restructure the issuer; and ii) statutory provisions prevent negative repercussions on the covered bond in such a resolution scenario. A systemically important covered bond might mobilise regulators, supervisors or the private sector to support and proactively avoid uncertainty among investors during resolution. The resolution regime assessment identifies the importance of relevant covered bond types and issuers in each country, allowing us to determine the incentives for market-led solutions. The analysis also addresses support mechanisms of direct stakeholders to the issuing entity that enhance the likelihood of a going concern of the cover pool. Further, we examine the track record of the proactive and transparent use of available resolution and restructuring tools to determine their likely impact on the covered bonds' credit quality.

The strong support provided by fundamental factors to covered bonds implies their credit quality far exceeds the risk suggested by the issuer's rating. For highly rated issuers, fundamental credit support can be the sole rating driver and result in a rating differentiation of up to six notches.

3.1 Legal framework analysis

The analysis of the legal framework seeks to determine whether i) legal protection can ensure uninterrupted payments on the covered bonds after issuer default; ii) the structure is protected from a moratorium on or the insolvency of the issuer; iii) credit protection provided by the cover pool and its eligibility criteria are robust and always in place; and iv) covered bonds can benefit from the preferential treatment of the resolution regime.

Rating considerations in the legal framework analysis

The analysis addresses whether the legal framework establishes the following:

- Clear, legally valid, binding and enforceable segregation as well as maintenance of cover pool assets and related derivatives upon the issuer's resolution or insolvency (for on-balance-sheet structures), or a valid perfection of transfer and a true sale in the case of covered bonds that use an SPV structure are in place; there is a level of documentation around the covered bond structure's ability to continue making uninterrupted payments of interest and principal and on derivatives according to the original terms and conditions. We expect a resolution event, moratorium, or an insolvency of the issuer to have no impact on the ability to make such payments. Furthermore, privileged derivatives and liquidity facilities contracted for the benefit of covered bonds should remain in place upon a regulatory-driven restructuring, moratorium or insolvency of the bank, and there should be no acceleration of the covered bonds if an issuer defaults or is placed under a moratorium.
- Asset eligibility criteria ensure that high-credit-quality assets are included and maintained in the cover pool and that documented risk management principles address and contain market and liquidity risks prior to and after insolvency.
- Programme enhancements should remain available, valid and enforceable vis-à-vis other creditors after a resolution event or insolvency (i.e. overcollateralisation that is higher than the statutory minimum or other maintenance obligations).
- Neither a regulatory action nor an issuer's event of default should impact the ability to manage the covered bond structure in the best interest of investors. The framework should allow proactive liquidity management for the benefit of covered bond holders. Analysts will examine how, in the case of a regulatory action or an insolvency, a potential conflict of interest between covered bond holders and other debtors is resolved.
- Independent and regular oversight of the programme structure (asset composition/structural risk) by either the supervisor or a special trustee is in place.

Importance of regulatory covered bond definitions

Covered bond frameworks vary significantly between common and civil law systems, insolvency regimes and mortgage markets. The legal framework analysis supporting covered bond issuance must therefore be specific to the country and possibly also the issuer, i.e. where no dedicated legal framework and/or specific terms and conditions address these concerns. Furthermore, the analysis needs to consider relevant changes in general insolvency regimes, developments in consumer-protection laws and other regulations that may affect the issuer, the enforceability of cover assets, and other aspects indirectly addressed in the covered bond regulations.

The legal framework analysis identifies whether aspects relevant for the enhancement of the covered bond rating above the issuer rating are fulfilled. The analysis is not static as stakeholders are constantly refining and enhancing covered bond frameworks. The bank recovery and resolution directive (BRRD) and similar resolution regimes in Europe expect the legal setup for covered bonds to follow the definitions in article 52(4) of the UCITS[5] Directive. Investors also expect that additional regulatory requirements are met, such as those stipulated for covered bonds in article 129 of the Capital Requirements Regulation (CRR)[6].

The principle-based European covered bond directive and corresponding changes to the relevant sections in the CRR were passed by the European Parliament in April 2019. Most European covered bond frameworks will have to be amended to comply with the changes, starting from the fourth quarter of 2019 and during an 18-month transition period. We will review the national transpositions and their impact on the legal framework assessment once available. The amendments are expected to be credit neutral or positive. National discretion is expected to improve existing standards rather than weaken investor protections.

We do not mechanistically use regulatory or best-practice-based definitions for the credit differentiation. We instead assess how minimum standards, which affect the ability to make uninterrupted payments in line with original terms and conditions, are provided and how they are impacted by regulatory-driven resolution events or, in extreme cases, a covered bond issuer's insolvency. Analysts also examine as part of the quantitative analysis of the cover pool whether additional covenants, which can survive both regulatory restructuring and the insolvency of the issuer, can be contractually agreed and relied on.

Credit differentiation guidelines

- The covered bond may benefit from credit differentiation of up to two notches above the bank rating if the legal framework provides for the following characteristics: i) upon the issuer's insolvency, covered bonds benefit from a segregated cover pool which allows ii) the uninterrupted payment of interest and principal on covered bonds after an issuer's insolvency. Further, iii) documented risk management principles that address and contain the assets' credit, market and liquidity risks prior to and after the insolvency are iv) buffered by overcollateralisation that remains fully available after the insolvency, and v) the covered bond structure is regularly monitored by an independent trustee or supervisor.
- If the characteristics from i) to v) above only apply partially, we may limit the credit differentiation. For instance, if covered bonds were to accelerate upon the insolvency of the issuer from either contractual or statutory provisions, the maximum uplift warranted by the legal framework analysis might only be one notch. Similarly, the provision of the full benefit is highly unlikely in the absence of dedicated oversight. This limitation reflects the fact that some of the main expectations of a covered bond, such as uninterrupted payment of the bonds after insolvency or special oversight, are not met[7].

3.2 Resolution regime analysis

Our view is that the much-enhanced regulatory architecture, including the resolution and recovery regimes, strengthens the stability and predictability of bank ratings. Improved capitalisation and the availability of additional bail-inable debt further increase banks' loss-absorption capacity, effectively facilitating resolvability. These measures also provide additional protection for covered

[5] Article 52(4), Directive 2009/65/EC of the European Parliament and Council from 13 July 2009 on the coordination of laws, regulations and administrative provisions relating to undertakings for collective investment in transferable securities (UCITS). Currently, the European Commission proposes a principles-based harmonisation of European covered bond frameworks: Proposal for a Regulation - COM(2018)93/DOCUMENT-2018-30931. As a result, the definition of a covered bond will move from article 52 (4) into a dedicated covered bond directive.

[6] Regulation (EU) No 575/2013 on prudential requirements for credit institutions and investment firms (CRR).

[7] Acceleration will not mechanistically cap the potential additional benefit from the cover pool analysis because the expected-loss rating definition factors in both the likelihood of a default and loss severity upon default. However, lower proceeds due to the very swift realisation of the cover pool upon acceleration generally limits the benefit of the cover pool analysis – compared with an orderly covered bond wind-down.

bonds given the significant increase in the level of stress a bank can absorb before an investor needs to solely rely on the cover pool to make repayments. Consequently, in a resolution regime scenario, covered bonds have a significantly lower probability of default than before.

Resolution regimes that maintain a covered bond issuer as a going concern keep the covered bonds linked to the issuer rating. A regulatory action that maintains the bank as a going concern would usually not decouple the covered bond structure from the issuer nor cause the covered bond's risk and protection structure to become static, as in the case of an issuer's insolvency or default.

A regulatory intervention resulting in a restructured or resolved bank is likely to prompt the bank to refocus its business model and change its financial, risk and funding profiles. Over time, this will lead to a different risk structure in the cover pool compared to the pre-resolution status quo, thus highlighting the relevance of the issuer for the covered bond rating. However, we do not expect a covered bond's risk and protection structure to immediately or adversely change after a regulatory action. Even so, the cover pool characteristics will remain within the boundaries of regulation and hence within a known, and thus anticipated, level of risk.

When analysing the resolution regime, we determine whether country- or issuer-specific aspects could impact the ability and incentive of regulators to restructure or resolve the covered bond issuer. The assessment of a bank's resolvability is essential to a fundamental, resolution-regime-based rating approach. The cover pool's short-term liquidity is much more relevant for banks which we regard to have a low likelihood of resolution or to be non-resolvable, than for resolvable banks.

We also assess how the transparency of processes benefits from the clarity, predictability and track record of regulators in implementing a resolution. The analysis incorporates the likely supervisory treatment of voluntary and contractually committed overcollateralisation that is above the statutory minimum. The aim is to assess how supervisors will act on the bail-in of unsecured liabilities and to what extent systemic considerations in support of covered bonds are relevant. These aspects are important to our understanding of the issuer's ability to maintain covered bonds as a going-concern funding instrument – even during a resolution process. If we believe that a regulatory action on the issuer is unlikely to impact a covered bond as a going concern, this will translate to a reduced likelihood of default, for which we may assign up to four notches of uplift.

Application in countries without a dedicated resolution framework

For countries without a specific resolution framework, we will assess whether supervisors tend to follow a similarly proactive, transparent and predictable resolution approach for a covered bond issuer that requires closer monitoring and is likely to become insolvent. We assess whether a covered bond issuer is more likely to be declared insolvent or whether the aim is to maintain the issuer and its covered bonds as a going concern.

Credit differentiation guidelines

We ascertain the uplift of the covered bond to the bank rating provided by the applicable bank resolution regime by assessing the likelihood that regulatory intervention preserves the covered bond's credit quality. Factors include:

- Whether the covered bonds are defined in line with statutory provisions in resolution regimes and are thus not impacted by regulatory intervention; or whether, in the absence of formal resolution tools, regulators or other market stakeholders are still more likely to support a (re)solution which avoids bank failure and an adverse impact on the covered bonds.
- Whether the issuer's business model, systemic importance, liability and capital structure, or level of bail-inable debt and incentives allow regulators to use available resolution tools to restructure the issuer in a way that maintains the covered bond programme as a going concern. In this context, we also look at the extent and sustainability of support provided by stakeholders (including the issuer's shareholders). This includes documented liquidity lines, guarantees, maintenance of the cover pool's quality and overcollateralisation as well as service and operational agreements.
- Whether covered bonds are a systemically important funding tool used by most banks in the country and whether this covered bond type is the main refinancing tool for an economically important type of asset. We also assess whether the issuer is a relevant covered bond issuer and the product has a significant share of domestic investors.
- Whether there is an active domestic stakeholder community (regulators, issuers and investors) that proactively monitors market developments, actively maintains confidence in the product, and possibly encourages improvements in the relevant regulations. In addition to the indirect stakeholders the analysis also addresses incentives or documented support mechanisms of direct stakeholders (including shareholders) to the issuing entity (i.e. the provision of asset replacement mechanisms, external liquidity support, minimum level of overcollateralisation or servicing agreements) which enhance the likelihood of the

going concern of the covered bonds. This includes an assessment of the clarity and predictability of relevant statutory provisions and the relevant authorities' interpretation of and track record in these.

If the above factors are fully met, regulatory action regarding the issuer is unlikely to impact a covered bond as a going-concern instrument. This results in a significantly reduced likelihood of default, and thus a lower expected loss, translating into up to four additional notches of rating uplift to the covered bonds. If the above elements apply only partially, the benefits of the resolution regime will be limited, reflecting the increased likelihood of the covered bond's winding-down and the cover pool becoming the sole source of repayment. For resolvable banks, the liquidity assessment of the issuer and its ability to repay covered bonds on time would reflect the fact that a bank in resolution needs to remain liquid and will benefit from access to a central bank's liquidity and support as long as it is solvent.

4 Cover pool analysis

4.1 General foundations

For issuers whose covered bond programme achieves AAA ratings based on fundamental credit support, the cover pool analysis does not constitute a rating driver. In such cases we may only carry out a limited cover pool analysis (see Appendix IV).

For issuers whose covered bond programmes do not achieve AAA ratings based on fundamental credit support, a detailed cover pool analysis is carried out. A cover pool with a strong credit profile can result in a high credit differentiation. The additional credit differentiation based on fundamental credit support is capped at three notches, resulting in a total of nine notches, except for conditional pass-through programmes.

To reflect an additional cover pool-based credit differentiation in the final rating, the credit characteristics of the covered bond structure must be strong enough to counteract the stresses commensurate with the distance between the bank rating and the covered bond rating. The higher the benefit of the cover pool to the covered bond's rating, the more resilient the cover pool's credit performance must be in case of stress (see Appendix II for further details on the covered bond risk analysis).

The cover pool analysis is split into i) the asset credit risk analysis (section 4.2.1); ii) the cash flow risk analysis (section 4.2.2); and iii) auxiliary risk considerations (sections 4.2.3 to 4.2.6). The asset credit risk analysis is based on the issuer-specific credit performance of the relevant cover pool assets. The results of the asset credit risk analysis are used in the cash flow risk analysis, with the latter implemented in Scope's covered bond cash flow model (CobEL – covered bond expected loss model). We use the model to calculate a covered bond transaction's expected loss and test the resilience of the covered bond's cash flow structure against stresses commensurate with the issuer rating differentiation in question (D_0 to D_{max}).

We analyse the cover pool 'as is' at the time of the reporting. The analysis will, however, adjust for any material changes to the composition of the cover pool or if our forward-looking view suggests the need to amend key variables. Changes often relate to amendments to the bank's business strategy (e.g. a refocus on commercial or residential mortgage lending), changes driven by regulatory developments (e.g. certain asset types become ineligible), or mergers and acquisitions resulting in a shift in the covered bond programme's risk profile.

4.2 Covered bond expected loss

Scope's covered bond model (CobEL) calculates the expected loss of the covered bond programme, considering scenarios in which the bank remains capable of repaying the covered bond and those in which recourse to the cover pool is needed.

In general, issuer default events can be independent of defaults in the covered bond pool. However, it is very likely that market conditions that cause stress in the pool will also cause the issuer to fail. We therefore conservatively assume that the issuer is in default when cover pool default rates are high, using the dependency copula (the issuer's cumulative default probability is equal to that of the covered bond programme) to link the two events.

The expected loss is therefore calculated over all default rates with a cumulative probability that is higher than the issuer's lifetime default probability. The latter is taken from our expected loss and default probability curves[8] based on the issuer rating and the

[8] See Appendix I of the General Structured Finance Methodology.

weighted average life of the outstanding covered bonds. The expected loss of the covered bond is used to determine the maximum cover pool uplift (for further detail see 'Determining the Covered Bond's Expected Loss' in Appendix II and the implementation in Scope's covered bond cash flow model in Appendix III).

4.2.1 Credit risk analysis of cover pool assets

Statutory eligibility criteria in legal frameworks mitigate loss-given-default by defining a minimum credit quality and asset classes that can be included in the cover pool. The quality of the cover pool is often well above minimum standards. However, if the asset quality of the bank deteriorates, the average credit quality of the cover assets is likely to deteriorate as well. Our rating analysis incorporates the impact of increasing stresses, thereby testing the rating's resilience against deteriorating performance and changing cover pool risk profiles.

Our credit risk analysis considers the issuer's underwriting expertise and issuer-specific performance data. In the absence of issuer-specific information, our base case assumptions take recourse to those used in the asset- or collateral-risk analysis for structured finance transactions with the same or similar asset classes, or other market data.

Our assumptions generally incorporate available information about the assets' market performance over long periods, including past credit crises.

Asset and portfolio characteristics determine the credit risk analysis

We use market-standard data-analysis frameworks to establish time-dependent loss distributions of the cover assets. These allow a consistent analysis of credit risk across asset classes with collateral exhibiting varying levels of granularity and homogeneity.

We assess concentrated cover pools with limited diversification using the Scope PM – a Monte Carlo simulation model[9]. We use this model for the asset risk analysis of public-sector cover pools, concentrated commercial real estate exposures or substitute assets. The analysis calls for asset-by-asset credit projections, with detailed and specific assumptions for each asset included as collateral (see 'Public Sector and Substitute Asset Credit Risk Analysis', Appendix II).

Homogeneous and granular mortgage cover pools are analysed using a portfolio approximation approach (parametric default distributions such as normal inverse). Inputs include: i) a measure of mean default probability; ii) a variance or correlation parameter; and iii) recovery rate assumptions. These generic inputs are calibrated based on historical data and adjusted for qualitative judgement regarding cover pool assets.

We determine asset default and loss distributions by assessing information on loans in the cover pool (such as, but not limited to, loan-to-value ratios, borrower characteristics, seasoning and property types) as well as performance indicators (see 'Mortgage Credit Risk Analysis' in Appendix II).

We analyse mixed cover pools by combining the different analytical frameworks. A cover pool made up primarily of granular residential mortgages can be supplemented in certain jurisdictions by commercial real estate, as well as by up to 20% of 'substitute collateral'. Depending on granularity, we may analyse the credit risk of the different mortgage asset types on either a segment-per-segment or aggregated basis. The credit risk of substitute collateral and public-sector cover assets are always analysed on a sub-pool basis.

Importance of cover asset eligibility definitions and credit risk volatility

If a granular cover pool becomes less diversified or comprises assets whose credit performance may exhibit significantly higher credit volatility, we assess whether our generic assumptions need to be adjusted. Analysts also assess whether framework- or issuer-driven replenishment criteria necessitate adjustment to the cover pool's current composition to allow for a potential deterioration or change in segments.

[9] For further details see Appendix III: 'Technical Note on Scope's Portfolio Model (Scope PM)' of the General Structured Finance Rating Methodology, available on www.scoperatings.com.

We update the asset credit analysis at least annually, unless the cover pool changes materially. Credit measures for a cover pool typically have low volatility because of stable underwriting criteria, the long maturities of cover pool loans, the typically large size of the cover pool and its regular replenishment.

A cover pool made up exclusively of large, risky credit exposures, such as ship or aircraft loans, usually has higher potential volatility. As a result, we do not expect such a cover pool to translate into a significant credit differentiation in addition to the uplift from fundamental support-based analysis.

4.2.2 Cash flow risk analysis

The cash flow risk analysis establishes the expected loss of the covered bond structure using Scope's CobEL model. We analyse the sensitivity of covered bond cash flows towards increasingly stressed assumptions[10]. We also assess whether the resulting expected loss for a given level of overcollateralisation[11] is lower than the expected loss of the corresponding target rating.

The cash flow risk analysis looks at scheduled cash flows and the impact of asset credit and residual market risks (refinancing and reinvestment risk; interest-rate and foreign-exchange risks), the hedging structure, senior costs for maintaining the cover pool's operations or other relevant cash flow assumptions, e.g. prepayment assumptions. In the case of liquidity shortfalls, we project the impact of a fire sale of assets. These incorporate discount rates that reflect the specific composition of assets in the cover pool as well as the rating distance between the bank rating and the covered bond rating. The discount rates also reflect country-specific elements and systemic importance considerations.

Refinancing risk and sale of cover assets

Cover assets, especially those relating to mortgages, often have longer maturities than those of the outstanding covered bonds. Further, cover assets amortise gradually whereas traditional covered bonds promise a bullet repayment. Therefore, it is very likely in a stressed scenario that a standalone cover pool will incur liquidity shortfalls[12]. We analyse the cover pool's ability to maintain uninterrupted payments according to the original terms and conditions by examining the impact of stressed asset sales in scenarios where the cover pool is the sole source of repayment.

For asset sales, we determine the remaining net present value (NPV) of future cash flows generated by the cover pool (see section 4.2 'Asset Sale' in Appendix II). The NPV of the cover pool is calculated using a discount curve, incorporating asset-specific liquidity premiums (see section 4.3 'Asset Liquidity Premiums Sale' in Appendix II). From this NPV, the proceeds needed to repay the next maturing covered bonds are subtracted and the remaining performing assets proportionally reduced. The analysis continues until the last covered bond is repaid.

If a covered bond structure already prescribes a mechanism for selling cover assets upon a liquidity shortfall (such as the Selected Asset Required Amount – SARA clause – or Supplemental Liquidity Reserve Accounts – SLRA), the cash flow analysis reflects these mechanisms as documented. Alternatively, and if this option is available, the impact of refinancing shortfalls and the use of asset amortisation to repay a liquidity line could also be factored in.

Reflecting systemic relevance when determining liquidity premiums

In countries where covered bonds have high systemic importance, we expect the most likely buyers of cover pool assets to be those with a major interest in keeping the covered bond market functioning. The liquidity premium used for discounting cash flows therefore reflects the spreads specific to the issuer's country and covered bond type.

We believe that a fire sale of cover assets is not always the most likely scenario in a post-resolution framework. This means that, in the case of alternative financing options, we will not use the highest spreads observed for a comparable securitisation's asset class or covered bond type as the reference point for the stressed liquidity premiums.

[10] Starting from the issuer rating or base case (D_0), we apply increasing stresses to the asset, market and refinancing risks. Stresses are scaled depending on the rating distance between the issuer rating and the maximum rating uplift. For further details see Appendix II, Section 1 'Rating-Distance-Dependent Stresses'.

[11] See 'Available Overcollateralisation' section further below.

[12] Barring CPT covered bonds whose repayment obligations switch from a bullet to an asset repayment-dependent pass-through.

On the other hand, in countries where covered bonds are only used opportunistically, we instead base our assessment on securitisation spreads, as potential buyers would want the purchase price to reflect the opportunity costs of having to securitise the assets.

Furthermore, refinancing assets present in 'traditional' covered bonds, such as mortgage and public-sector covered bonds, are, in our view, likely to be less sensitive to market disruptions than more bespoke covered bonds, including those backed by shipping, aircraft and SME assets. Spreads for non-standard assets need to reflect their lower potential liquidity. The liquidity premium will also reflect that covered bond structures may have recourse to other refinancing options than asset sales i.e. repo financing (for further details on refinancing spreads assumed for public-sector collateral see Appendix II, Figure 10; for mortgage collateral, see Appendix II, Figure 11).

Interest-rate and foreign-exchange risk analysis

On-balance-sheet covered bond structures are often also exposed to interest-rate and foreign-exchange risks. Most covered bonds that make use of SPV structures benefit from almost-perfect hedging mechanisms.

Our risk analysis uses the current forward rates as the central scenario. Scope's CobEL model determines the impact of adverse market rate developments on the instrument's expected loss by applying deterministic sensitivity tests (see Appendix II). These tests help us to identify which adverse market rate developments the cover pool is most sensitive to.

Reinvestment risk

If proceeds are not needed to pay interest or repay maturing covered bonds, we assume they can be invested at current short-term market rates[13].

Other cash flow analysis inputs

Several inputs for the cash flow analysis are based on factual information available in the legal documents, as well as the terms and conditions related to the issuance. When parameters are not contractually specified, these are incorporated into the analysis as variables based on our qualitative assessment. Furthermore, overcollateralisation which is sufficient to support the rating may also incorporate additional amounts to cover identifiable and quantifiable counterparty risks. If high excess spread allows the rating to be supported below par, we will set a zero floor to the respective overcollateralisation.

The static cash flow analysis is complemented with our forward-looking views on the potential development of the cover pool structure. We might analyse the impact of new issuance activity on the mismatches, the sensitivity of the rating to changes in overcollateralisation as well as the impact of changing asset risk structures.

4.2.3 Availability of overcollateralisation

Overcollateralisation is the most actively managed variable that can support and maintain a covered bond's ratings well above the bank rating. The issuer's ability and willingness to provide such overcollateralisation therefore plays a key role.

The higher the level of overcollateralisation, the better-protected the investors will be in the event of an insolvency. This is why issuers generally provide overcollateralisation at levels well above the legal minimum. We believe highly rated issuers that regularly access capital markets with new issuances have a strong incentive to predictably manage overcollateralisation levels. As all covered bonds rank pari-passu among each other, any adverse management of overcollateralisation is relevant not only for the rating of new issuances, but also for the ratings of existing covered bonds of the same type.

Our methodology aims to avoid rating volatility caused by an issuer's adverse management of available overcollateralisation. Without contractual commitments, an issuer is more likely to exercise its discretion negatively if its bank rating falls[14].

[13] Programme-specific reinvestment assumptions reflect whether cash proceeds need to be readily available. We will then assume that they would need to be invested in highly liquid and high-credit-quality short-term assets that typically yield less than short-term market rates. If proceeds are sizeable, available for longer periods and the programme documentation or legal framework allows re-investment into higher-yielding 'eligible assets', we will also identify the sensitivity towards investments that yield more than market rate.

[14] Rating-sensitive capital market funding might no longer be economically feasible for lower-rated issuers; they could instead turn to collateralised central bank funding. The maintenance of minimum rating thresholds that allow for central bank access using covered bonds might result in lower overcollateralisation than that needed to support ratings that facilitate direct capital market access.

Our analysis considers available overcollateralisation if the issuer has a bank rating of at least BBB.[15] If the rating is below this, analysts account for available overcollateralisation if the issuer's communication on overcollateralisation to the capital market is sufficient, robust and in line with expectations.[16] We will adjust down the level of overcollateralisation in the absence of such statements, reflecting past observed volatility and our forward-looking view on expected overcollateralisation. Furthermore, we only consider the legal minimum for issuers rated BB and below if there are no public contractual commitments.

4.2.4 Liquidity provisions after issuer default

Improved regulatory frameworks, the introduction of resolution regimes, and increased and more proactive supervision have significantly reduced the 'jump to default' risk for banks. Combined with the special regulatory treatment for covered bonds, we do not believe a covered bond programme's current exposure to mismatch risk will directly translate into a liquidity-driven default risk for covered bonds after an issuer has been designated as non-resolvable and put into liquidation.

The reflection of short-term liquidity risk is generally relevant for covered bond ratings where cover pool support allows the enhancement of ratings above fundamental support factors. Covered bonds issued by non-investment grade banks are generally expected to benefit from additional liquidity protections to avoid payment disruptions after issuer default. Our analysis reflects the relevance of mismatches, as well as any mandatory or contractual liquidity protection mechanisms[17] and the periods these cover. The assessment of the underlying cover assets' liquidity also plays a role in determining whether we should grant the full additional cover pool analysis-based uplift or only part of it.

For resolvable banks, the liquidity assessment of the issuer, and thus its ability to repay covered bonds on time, would address the fact that a bank in resolution needs to remain liquid and will benefit from access to central bank liquidity if it is solvent. For non-resolvable banks, our liquidity assessment of the issuer and the covered-bond-specific mitigants will be performed as part of the cover pool and cash flow analyses.

[15] If we observe overcollateralisation volatility close to the level needed to support the current rating and if no public commitment guidance is provided by the issuer, we are likely to use a stressed low-point overcollateralisation based on prior-year trends.

[16] We generally expect capital market communication to become more assertive and include dynamic elements as the bank rating falls, to describe a predefined withdrawal process and a minimum period before the issuer reduces overcollateralisation.

[17] Either allowing for maturity extensions or the provision of liquid assets.

4.2.5 Counterparty risk

Our methodology for counterparty risk in structured finance transactions (available on www.scoperatings.com) is the basis for assessing dependency on key counterparties and how this can impact the cover pool analysis. The guiding principles are the materiality of counterparty risk (excessive, material or immaterial), differentiation between financial risk and operational risk, and the analysis of risk remedies in the specific context of the covered bond transactions.

We analyse whether the performance and creditworthiness of a covered bond could be severely impacted by the inadequate short- or long-term credit strength of such external counterparties. This could constrain the potential benefit from the cover pool analysis. An effective replacement framework, or other mechanisms to mitigate structural risk for key agents, can typically avoid a negative impact. Ineffective remedies result in the quantification of counterparty risk, which can ultimately constrain the benefit of the cover pool analysis for the covered bond rating. This is especially relevant for counterparty obligations that are very significant, bespoke, or are provided by counterparties belonging to the same financial group as the issuer.

However, issuer and investor interests are generally more strongly aligned in covered bond programmes than in structured finance transactions. If the issuer is not in default, the covered bond programme needs to be maintained in line with regulatory requirements. If the credit strength of a counterparty relevant for the covered bond transaction has deteriorated, or it has even defaulted, the issuer would need to provide compensation and new proceeds to the cover pool. Therefore, for resolvable banks, the counterparty risk assessment for covered bonds would mainly address rating volatility that may arise from weak or non-performing counterparties.

We expect covered bonds issued by non-resolvable banks rated below investment grade to be shielded against counterparty risk in the same way comparable structured finance transactions are. If provided remedies are ineffective, cannot be sized or residual risk is material, covered bonds might become linked to the counterparty's credit risk.

4.2.6 ESG risk

Environmental, social and governance (ESG) principles and their impact on a covered bond's collateral are also increasingly gaining importance for the credit analysis. Governance in the origination, underwriting or workout of loans and collateral have already been considered in past analyses – via asset performance. Environmental and social aspects are new 'soft' factors which will also gain relevance for the covered bond analysis over time.

Today, green or social covered bonds are an integral and growing feature of the wider ESG issuance universe. Cover assets often already comply with environmental and social standards[18] and, if not yet available, 'use of proceeds' promises will introduce or further increase the share of compliant assets in the cover pools over time.

Asset credit risk and secondary-market liquidity are the most likely areas where ESG aspects will impact the covered bond credit analysis. Buildings, the most common collateral in covered bonds, account for 40% of global primary-energy consumption and 30% of CO_2 emissions. The EU's energy savings target as part of its COP21 commitments will further increase the share of 'green' mortgage collateral. Over time, compliant collateral may benefit from lower market value volatility because of the stronger backstop against value declines. Borrowers that finance eligible ESG collateral could benefit from higher affordability. This is because energy bills reduce, or lower debt-servicing costs effectively reduce their default probability, among other reasons.

Vice versa, foreclosure proceeds from non-green collateral might become more volatile due to rising energy costs, higher fossil fuel prices and the prospect of carbon regulation – all of which might force potential buyers to factor in additional refurbishing costs, thereby lowering potential foreclosure proceeds. The assets may even become 'stranded', which would have a severe impact on foreclosure proceeds and thus become relevant for the assessment of asset credit risk.

Our asset credit risk analysis is non-mechanistic and uses available performance data. We therefore monitor developments such as the ECBC's Energy Efficient Mortgage Initiative or academic research that examines how ESG affects a borrower's probability of default, collateral value and, thus, loss given default. We will incorporate available issuer-specific or market information that robustly supports differences in asset-credit risk between ESG-compliant assets and other assets in the cover pool.

[18] Such as the ICMA's Green, Social, Sustainable Bond Principles or similar industry initiatives.

Missing performance information (ESG data was often not recorded in the past) as well as the absence of a common taxonomy between countries currently prevents our credit analysis from distinguishing between standard collateral and ESG-compliant collateral. Even more so, incorporating such information might become a zero-sum game: High energy-efficiency is already mandatory in most markets (particularly in Scandinavia) and observed credit performance already reflects the likely benefits. Unless non-compliant cover assets are penalised (for example, through changes to tax regimes), we do not expect a significant impact in our current credit risk assessment from ESG factors. Splitting the two can thus be rating-neutral.

The more likely credit impact is the beneficial increase in the secondary-market liquidity of eligible assets. Regulatory developments already stipulate the disclosure or even a minimum level of investment in environmental or sustainable bonds. Sizeable portions of ESG-compliant collateral in a cover pool will therefore likely attract stronger demand and a wider investor base. If potential buyers can refinance such assets at a lower cost, our assessment can incorporate this in a cover pool's liquidity premium. To date, however, there is no evidence of such spread differentiation between traditional and 'social' or 'green' covered bonds.

5 Country risk

We do not mechanistically limit the maximum rating that a covered bond can achieve by the sovereign rating of the issuer's country or the origin of the cover pool, particularly in eurozone countries. At the same time, credit ratings must adequately and consistently reflect the credit risks of a financial instrument, including risks arising from an issuer or collateral in a country with weak economic fundamentals. Where relevant, our ratings therefore also incorporate an assessment of transfer risk (e.g. risk of capital controls), convertibility risk (e.g. risk of eurozone exit), the risk of an institutional meltdown, and the impact on the covered bond rating.

We analyse the impact of country risks for covered bond ratings on a case-by-case basis. Analysts ensure that Scope's view on the macroeconomic fundamentals of the relevant sovereign[19] are factored into the stresses that support covered bond ratings.

The importance of country risk may differ between covered bond and bank rating analyses as the cover pool's composition and risk profile are likely to exhibit different risk characteristics from the rest of the issuer's balance sheet. The relative significance of country considerations may also vary among issuers to the extent that the compositions of cover pools vary. Different cover pools may exhibit different sensitivities to our sovereign and country considerations.

6 Sensitivity analysis

We perform a sensitivity analysis to identify the key credit and cash flow variables driving the credit performance of the covered bonds. High sensitivities can result in adjustments to the rating and rating-supporting overcollateralisation to ensure rating stability.

[19] We consider the economy of the country to which most cover assets are sensitive. In general, we expect this to be the country in which the issuer is located.

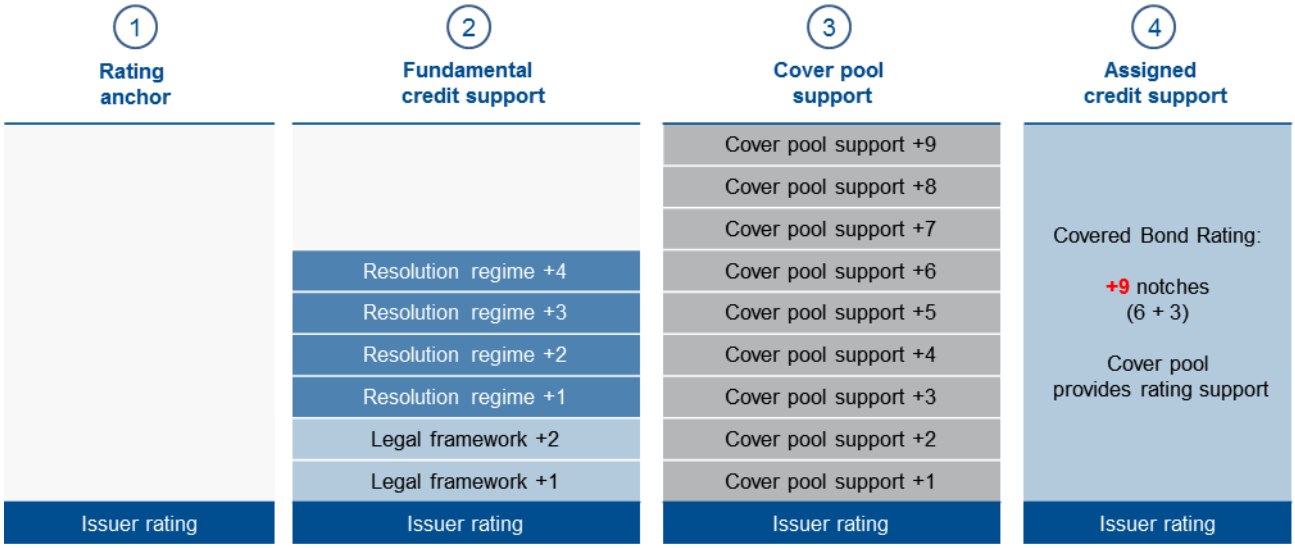
Appendix I Credit differentiation supported by cover pool assessment

The covered bond rating methodology rests on two analytical building blocks. The first block, the fundamental credit support analysis, comprises the analyses of the legal framework, resolution regime and systemic importance. The second consists of the cover pool support analysis. The final credit differentiation between the bank rating and the covered bond rating is based on the higher support provided by either of the two.

1 Cover pool-supported covered bond ratings

In this example the fundamental credit support analysis provides a credit differentiation of six notches, the cover pool analysis can support a further credit differentiation of up to three additional notches. Therefore, a cover pool-supported rating can be up to nine notches above the issuer rating (Figure 1).

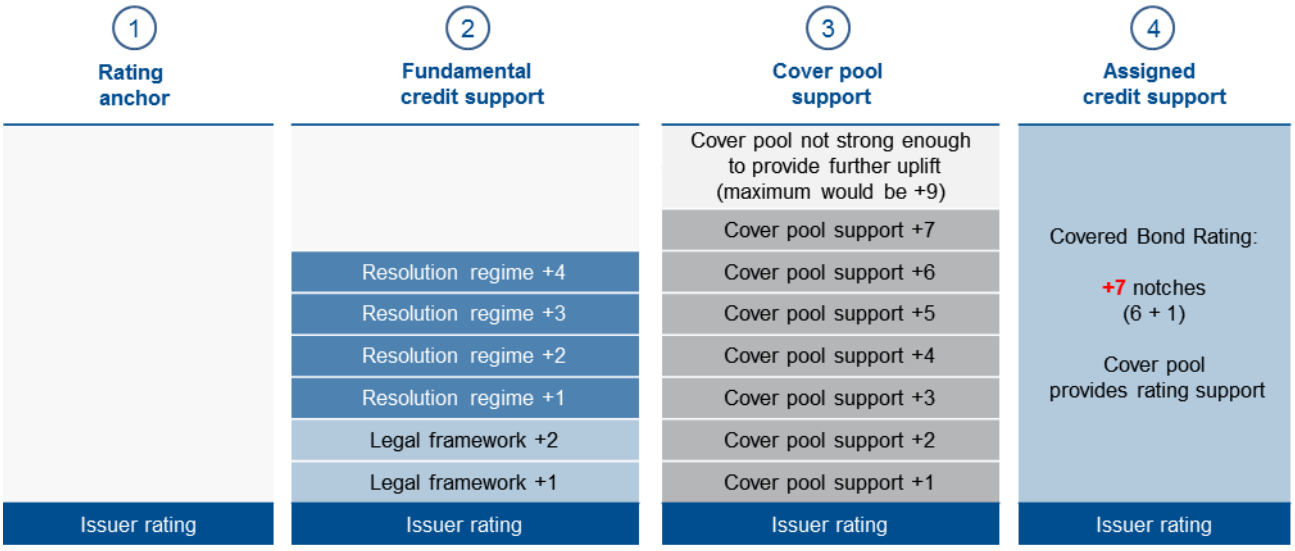
Figure 1 Covered bond rating – maximum uplift supported by the cover pool



Source: Scope Ratings

If the cover pool cannot support the maximum additional three-notch uplift, it might still be able to provide one or two notches above that from fundamental support (Figure 2). In the below example the covered bond rating will be seven notches above the bank rating if overcollateralisation results in one additional notch of uplift from cover pool support.

Figure 2 Covered bond rating – cover pool provides uplift but not the maximum

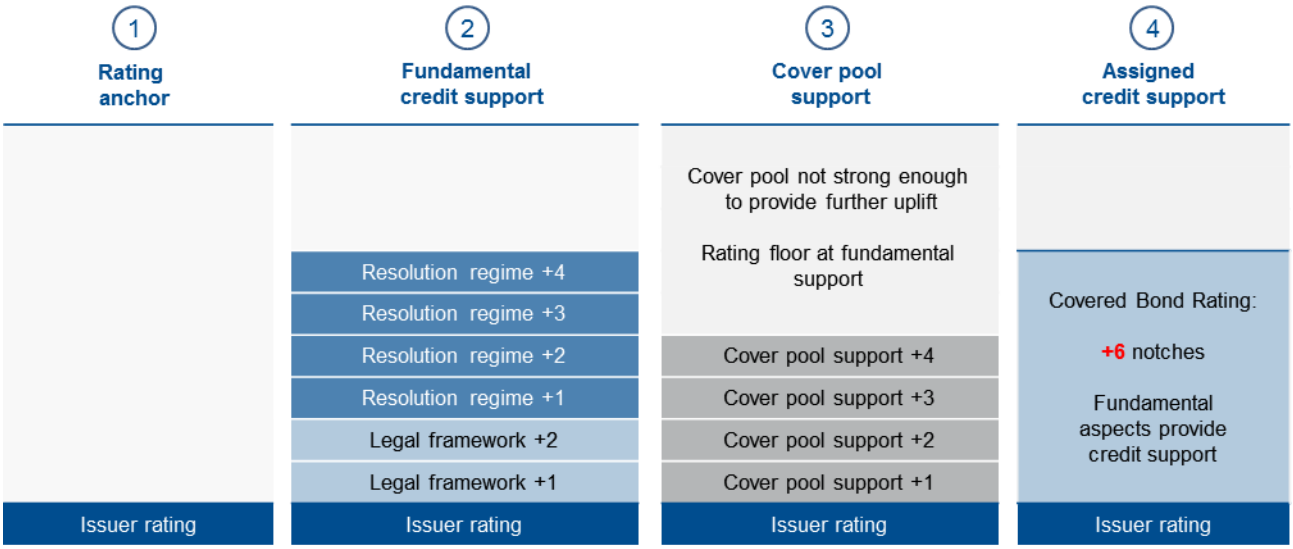


Source: Scope Ratings

2 Fundamental support-based covered bond ratings

The credit quality of concentrated cover pools, or covered bond cash flow structures that are unbalanced or insufficiently supported by overcollateralisation, might not provide a high uplift. The cover pool support could even be lower than the benefit provided by fundamental support (Figure 3). In this case, the covered bond rating will primarily reflect fundamental support, and not the strength of the cover pool. Figure 3 provides an example of a covered bond rating that primarily reflects fundamental credit support of six notches.

Figure 3 Covered bond rating – cover pool provides uplift but not the maximum



Source: Scope Ratings

A covered bond issuer rated in the 'single A' category in which covered bonds can achieve a six-notch fundamental uplift[20] would also qualify for a limited cover pool analysis. The covered bond rating is determined by the higher support provided by either the fundamental analysis or the cover pool assessment. As the fundamental support already allows the highest rating (AAA) to be achieved, the cover pool support only provides additional stability and is not the rating-supporting factor (see also Appendix IV for further information).

We believe excessive overcollateralisation cannot enhance the covered bond rating more than three notches above the uplift provided by the fundamental analysis, or even decouple the covered bond rating from the issuer rating. This is due to the issuer's discretion regarding risk management and the level of overcollateralisation, which, in our view, does not warrant larger credit differentiation. This also reflects concerns over excessive rating volatility in the case of adverse overcollateralisation management. When the issuer's discretion in these aspects is restricted only by the legal framework, the resulting flexibility is, in our view, also not commensurate with a larger credit differentiation.

An issuer's deteriorating credit profile is likely to result in a similar negative migration of a cover pool's credit quality – ultimately only limited by the minimum legal or contractual eligibility criteria. Furthermore, the ability to significantly reduce overcollateralisation over time also reduces the cover pool's ability to maintain an uplift above that provided by fundamental credit support.

Directly linking a covered bond's credit differentiation to that of its issuer is particularly relevant for traditional covered bond structures which comply solely with the country-specific covered bond framework and are maintained by a bank subject to either regulatory intervention or significant restructuring. The same applies when the cover pool is being wound down.

[20] A six-notch fundamental credit support will generally reflect that the bank operates in a country in which: i) covered bonds are governed by a strong legal framework (two-notch legal-framework-based uplift); and ii) the covered bonds are excluded from a bail-in and were issued by a resolvable bank with sufficient bail-inable debt in a covered-bond-supportive country (four-notch resolution-based uplift).

In contrast, a strong, legally binding assurance that an issuer will not adversely exercise its discretion to the detriment of investors could allow a higher cover pool-based uplift than generally provided by this methodology. Contractual provisions which, partially or in combination, could allow a higher uplift include: i) detailed programme-specific replenishment criteria, including more credit migration than provided by the legal framework; ii) structures that reduce refinancing risk (e.g. conditional pass-through structures); and iii) provisions ensuring a dynamic level of overcollateralisation which is commensurate with the risk profile and the rating in question. Such provisions would have to be provided contractually and permanently.

Appendix II Detailed cover pool support analysis

1 Determining the covered bond's expected loss

The calculation of loss rates of the cash flow structure for a given default distribution allows us to calculate the expected loss and expected average life of the covered bond structure. Along with our idealised expected loss curves[21], this allows us to determine the covered bond's rating under the given scenario.

The cash flow simulation addresses all default scenarios (ω_i) occurring with probability $p(\omega_i)$ to calculate the respective loss $L(\omega_i)$. The expected loss is then calculated as the probability-weighted sum $\sum_i p(\omega_i)L(\omega_i)$. Only a subset of these scenarios is relevant because the bank, as long as it has not defaulted, will shield the cover pool from losses.

Aggregating the scenarios that include a bank default scenario $\overline{\omega}$ we have:

Figure 1. Expected loss of a covered bond

$$\sum_i p(\omega_i \wedge \overline{\omega})L(\omega_i) = \sum_i p(\omega_i)p(\overline{\omega}|\omega_i)L(\omega_i) = \sum_i p(\omega_i)\tilde{L}(\omega_i).$$

The conditional probability $p(\overline{\omega}|\omega_i)$ depends on the dependency (correlation) between default scenarios and bank default events. Taking a general view, the assets of the covered pool will largely reflect the composition of the bank's assets and should therefore be highly correlated, i.e. bank default is more likely if we observe high default rates in the pool. This is also consistent with the worst-case scenario selection approach.

The total unconditional probability of a bank default $p(\overline{\omega})$ – in other words, the probability of the event leading to the detachment of the pool from the bank – needs to be defined externally. We establish the detachment point using our probability default curves, taking into account the issuer rating and the weighted average life of the outstanding covered bonds (unstressed).

The threshold default rate dr_T is defined so that the probability of default rates that exceed the threshold rate equate to the bank's default probability or its equivalent $p(dr < dr_T) = 1 - p(\overline{\omega})$. Under the protection of the bank, we then calculate the expected loss as the probability-weighted sum over all default scenarios with a default rate greater than the threshold default rate dr_T.

2 Rating-distance-dependent stresses

To quantify the credit benefits provided by the cover pool, we analyse the cover pool for resilience against increasing stresses. The severity of the stresses depends on the distance between the potential covered bond rating and the bank rating. We establish a base case stress which identifies the level of risk in the covered bond programme covered by the issuer. The analysis assumes the base case credit losses, current market conditions regarding interest and foreign exchange rate developments, and no additional liquidity premiums for asset sales. The highest achievable rating distance, D_{max}, could be as high as nine notches (which equates to a D_9 scenario). Generally, we anchor the highest stresses at levels commensurate with a AAA rating. Iteratively increasing the stress scenarios provides insight into the covered bond programme's resilience to adverse credit environments. We benchmark the quantitative results of the scenario analysis against our expected loss tables.

Example 1: Testing the cover pool's resilience to a level supporting the full rating distance

Assumptions: Issuer rating: BBB- (= D_0); fundamental credit support: six notches; maximum cover pool uplift: nine notches (D_{max} = D_9 = six-notch fundamental support uplift + three-notch cover pool uplift); rating distance between issuer rating and AAA: nine notches

To analyse whether the cover pool can fully support the rating uplift, we apply stresses commensurate with the highest rating uplift (D_{max}). In this case, the most severe credit and market risk stresses are equivalent to a D_9 stress[22]. Scope's CobEL model helps to determine the expected loss of the covered bond programme. If the expected loss for a given level of overcollateralisation is equal to or lower than the idealised expected loss at AAA[23], the scenario test has been passed and the suggested nine-notch credit differentiation is quantitatively supported.

[21] Scope's expected loss tables can be found in Appendix I of the General Structured Finance Rating Methodology at www.scoperatings.com.
[22] Stress scenarios for rating differentiations between the bank and the maximum achievable covered bond rating are determined by a linear interpolation.
[23] Appendix I of the General Structured Finance Methodology provides for the expected loss matrix. The benchmark is taken from the intersection of the target rating (here: AAA) and the weighted average maturity of outstanding covered bonds.

Example 2: Testing the cover pool's resilience to a level lower than the full rating distance

Assumption: Issuer rating: BBB+ (= D_0); fundamental credit support: six notches; maximum cover pool uplift: nine notches (D_{max} = D_9 = six-notch fundamental support uplift + three-notch cover pool uplift); rating distance between issuer rating and AAA: seven notches

In this example, the same maximum uplift is possible (D_{max} = nine notches), but the issuer rating is higher. The rating distance to the highest possible rating (AAA) only requires an uplift of seven notches, however[24].

We determine the supporting overcollateralisation by testing the resilience of the cover pool against a scenario in which the maximum uplift is anchored at a stress commensurate with a seven-notch stress scenario, corresponding to a D_7 stress (with D_7 equating to seven-ninths of the maximum stresses).

In this example, the highest rating is achieved but stresses are milder than expected for the highest rating. Further, only applying milder stresses could result in significant changes in supporting overcollateralisation. A downgrade of the issuer and its inability to provide additional overcollateralisation could result in a higher-than-expected rating volatility. As such, we complement the above with additional analysis. We will also determine the supporting overcollateralisation by taking the difference between a D_9 stress and the overcollateralisation needed to mitigate a D_2 stress (i.e. equating to two-ninths of the maximum stress).

Additional sensitivities against an issuer rating change are tested following the same rationale, assuming an issuer downgrade and upgrade, each by one notch.

Example 3: Testing the cover pool's resilience if the maximum distance is constrained by fundamental uplift

Assumption: Issuer rating: BBB+ (= D_0); fundamental credit support: four notches; maximum cover pool uplift: seven notches (D_{max} = D_7 = four-notch fundamental support uplift + three-notch cover pool uplift); rating distance between issuer rating and AAA: seven notches

In this example, the maximum rating distance corresponds to seven notches. For the analysis, this maximum distance can only be achieved if the covered pool can mitigate the highest stresses (D_{max} = D_7). The degree of stress is linearly interpolated between the prevailing interest rate (D_0) and the maximum stressed interest rate (D_7). Assuming the available overcollateralisation mitigates the highest stresses, a AAA rating can be assigned. If overcollateralisation is insufficient, we will reduce the intensity of stress (D_6 stress, equating to six-sevenths of the maximum stress) and test whether the lower rating can be supported. We will also calculate the complementary supporting overcollateralisation as explained in example 2.

3 Public-sector and substitute-asset credit risk analysis

3.1. Portfolio default risk analysis

We use the Scope PM[25] to analyse public-sector cover pools and substitute-asset sub-pools because such pools are often concentrated and less diversified than granular pools of residential mortgage assets. Scope PM's portfolio analysis framework allows us to estimate default statistics for a cover pool, taking the exposure's credit quality, amortisation profile and asset correlation assumptions into account.

Public-sector and substitute-asset cover pools may have large single-asset exposures with different concentration levels that pose idiosyncratic risks. For larger exposures, we use our own public or private ratings (generally for exposures larger than 10% of the cover pool) or credit estimates (for exposures between 5% and 10% of the cover pool). For granular exposures below the sovereign level and sectors typically found in public-sector cover pools (e.g. hospitals or utilities that are majority owned or guaranteed by the public sector), Scope's public finance analysts establish sector- or exposure-specific relative rankings of credit risk[26]. We apply the same process to substitute-asset sub-pools, i.e. our sector specialists assess the credit risk of the individual exposures.

For the mapping of smaller, granular exposures, we may use the issuer's internal credit analysis or our own expert-driven credit assessment (see below). As a general rule, we will reflect an issuer's weaker credit assessment of an exposure, taking into account the issuer's more direct relation to the obligor.

[24] One additional notch of cover pool support already allows the highest rating to be achieved. If sufficient overcollateralisation is available, cover pool support allows the current rating to be maintained upon an issuer downgrade of up to two additional notches, providing additional rating stability. We often refer to the remaining, currently not needed support as 'unused notches' or the 'rating buffer'.

[25] For further details see Appendix III: 'Technical Note on Scope's Portfolio Model (Scope PM)' of the General Structured Finance Rating Methodology available at www.scoperatings.com.

[26] Ratings, credit estimates as well as relative rankings are established based on the principals of the relevant methodologies (e.g. Rating Methodology: Public Finance Sovereign Ratings; Rating Methodology: Sub-Sovereign Credit Rating or Rating Methodology: Government Related Entities); rankings are typically provided on a scale from 1 to 20.

Figure 2. Preferred method to assess and monitor credit quality of cover pool assets

Top obligor concentration (% of cover pool balance)	Credit quality derived from:
Less than 2%	Mapping of external credit risk measures available to Scope[27]
Less than 5%	Mapping an individual outcome validated by Scope analysts
Less than 10%	Credit estimate or similar assessments by Scope or its affiliates
10% or more	Public or private ratings

Source: Scope

Analytical approach for granular public-sector exposures

The portfolio credit analysis using Scope PM establishes credit assessments for cover pool exposures. Public-sector cover pools also comprise granular and non-publicly rated sub-sovereign exposures or exposures to government-related entities for which we would need to establish credit risk measures for generic asset 'types'[28].

Our individual credit assessments for exposure types representing below 5% of the cover pool start with our sovereign rating or a similar credit assessment. Sector experts analyse the respective institutional framework, focusing on: i) institutionalised support; ii) fiscal interlinkage; and iii) political alignment between government tiers.

The strength of the institutional framework assessment results in an indicative ranking range for regions, whereby the stronger (weaker) the framework, the narrower (wider) the range vis-à-vis the respective sovereign rating. We rank the regions and adjust the distance to the sovereign based on, for instance, blended ratios including GDP per capita, (measured as a percentage of the euro area average) or the regional unemployment rate. Scope analysts may use different references for non-European exposures or adjust those to reflect aspects such as regional differences.

The institutional framework assessment is also used for the initial evaluation of lower-tier exposures such as municipalities. Like for regions, we establish adjustments across the board, whereby the stronger (weaker) the framework, the lower (greater) the adjustment vis-à-vis the respective sovereign rating. This adjustment is a starting point and refined in a second step. Additional upward or downward adjustments can reflect additional regional indicators such as: the population, GDP per capita (as a percentage of the euro area average) or the unemployment rate.

For public-sector companies and other public-sector-guaranteed companies, our starting point generally consists of the credit risk assessment of the public-sector guarantor or majority owner. For companies that benefit from a direct, unconditional and irrevocable guarantee, we generally align the credit opinion with its direct guarantor. For other eligible public-sector exposures, a negative adjustment is possible depending on the relationship between the sponsoring public-sector entity and the respective cover pool exposure (based on the entity's legal status and the impact of the liability support mechanism or shareholder structure). For insignificant individual exposures we may also use conservative credit assumptions, e.g. in the case of unclear ownership structures or only implicit liability support mechanisms.

3.2. Portfolio correlation assumptions

Correlation parameters are essential to the Gaussian copula function used to obtain a portfolio's default rate distribution. For each iteration of the Scope PM's Monte Carlo simulation, asset defaults are determined by comparing a random asset value against a defined threshold derived from the asset maturity and Scope obligor rating. This random asset value is constructed as a standard Gaussian random variable, defined as a linear combination of standard independent Gaussian random variables. The independent Gaussian random variables comprise a set of market risk factors as well as an idiosyncratic component specific to the asset in question. The common market risk factors define the default dependency framework, simply referred to here as the correlation framework.

[27] Internal rating models of the originator or public ratings from ECAI. We may use those credit measures and adjust them as necessary.
[28] Types refer to small individual exposures to government-related entities in a specific region which share similar credit characteristics.

Our correlation framework for public-sector and substitute-asset cover pools is defined through three market risk factors:

- Global: this reflects macroeconomic influences.
- Country: this high-level geographical factor reflects a common dependency on general economic and political developments domestically.
- Local: obligors active in the same region or industry often have the same business cycle and perspectives.

The weights attributed to each factor are used to determine the interdependence between the different public-sector entities and reflect the different transfer mechanisms between the sovereign and sub-sovereigns, oversight or guarantee structures. Larger weights assigned to the market risk factors imply smaller idiosyncratic risk and contribute to scenarios in which widespread default in the collateral pool is more probable.

Our indicative average correlation parameters for concentrated cover pools are set out in Figure 3.

Figure 3. Indicative average correlation parameters for concentrated cover pools

Market risk factor	Correlation parameter
Global	2.0%
Country	5.0% - 22.0%
Local (region, industry or type)	10.0%

We consider these correlation parameters in the context of European public-sector cover pools and eligible substitute assets. If the composition differs significantly, we may adjust the correlation framework or its components for this additional risk. For example, we apply a higher bivariate correlation for covered bonds secured by mortgage loans and we increase the correlation for the largest obligors.

3.3. Recovery rate assumptions for public-sector exposures in cover pools

Recovery rates applied for public-sector assets reflect stresses which depend on the rating distance between the issuer and the covered bond rating. Recovery rates used in the cash flow simulation reflect the weighted average recovery rates of the individual exposures. Stressed recovery rates are linearly scaled between the base case (D_0) and the highest achievable rating distance D_{max}[29]. We generally assume complete recovery of defaulted public-sector exposures in the central scenario prior to applying any rating-distance-dependent stresses (D_0 recovery = 100%). In the most severe stress scenario, we apply asset- and country-specific public-sector recoveries. These reflect the individual borrower's guarantee structures, country-specific transfer and equalisation systems, as well as the tiering of public-sector exposures. Based on available academic research we generally assume the lowest recovery rates (D_{max} stress) for sovereign exposures by applying a 40% recovery expectation; for sub-sovereigns or municipalities, the stressed recovery rates can be as high as 80%. We use a 50% assumption for public-sector companies or other eligible guaranteed exposures. Assumptions reflect the most severe stresses applied in the D_{max} scenario. Recovery assumptions are designed to assess public finance risks in the specific context of both the cover pool analysis and the cash flow modelling approach[30].

[29] Assuming the issuer is rated BBB- and the fundamental framework analysis results in an uplift of six notches, the cover pool analysis would only allow an additional credit differentiation of three notches. This translates into a maximum rating distance of nine notches between the bank rating and the covered bond rating. The stress scenario commensurate with the highest elevation is denoted in this example as the D_9 stress scenario.

[30] A very high recovery rate can still apply significant stress to the covered bond's cash flow (see section 2.4. 'Recovery Timing Assumptions'). In our simulations, even a 100% recovery would lead to an NPV loss due to the longer maturity of the cash flows. The cash flow profile may become further stressed, however. Scheduled asset proceeds needed to pay interest or repay principal would be unavailable because of the moratorium. To allow timely payment to continue, a cover pool manager might therefore need to undertake a fire sale of cover assets. Our asset sale simulation generally adds stresses as it incorporates: i) stressed interest-rate and foreign-exchange scenarios; and adds ii) a liquidity premium (see 4.2 'Asset Sale' in this appendix).

3.4. Recovery timing assumptions

Public finance insolvency processes generally differ from those in the private sector. The process can be lengthier; exposures become restructured rather than proceeds from a foreclosed security being received in a lump sum; investors need to make concessions regarding their interest; and maturities become extended. We assume that public-sector payment obligations (principal and interest) would be placed under a moratorium. Following the end of the moratorium, payment obligations would be reinstated at the assumed stressed recovery rate (principle and interest) and the original terms and conditions would be extended by the length of the moratorium. We conservatively assume a moratorium to last 48 months.

Substitute assets may also comprise assets for which we apply different recovery timings. For example, the analysis of recovery timing for covered bonds secured by mortgages will be in line with that of the respective asset type.

4 Mortgage credit risk analysis

Cover pools comprising mortgage loans are mostly granular and analysed using a portfolio approximation approach. We analyse cover pools according to standard default-probability distribution laws. This approach limits the number of inputs to: i) a measure of mean default probability; ii) a variance or correlation parameter; and iii) recovery rate assumptions.

4.1. Portfolio default projections

We analyse the default pattern of mortgage pool portfolios using an inverse Gaussian distribution characterised by a mean and a coefficient of variation. We use issuer-specific performance information[31] and the asset characteristics of the relevant sub-portfolios to: i) directly establish issuer-specific lifetime default rate assumptions and a coefficient of variation[32] for the respective asset type (e.g. by using vintage data); or ii) calibrate country-specific assumptions for similar asset types (e.g. by using delinquency information, among others).

When calibrating assumptions on mean default rates and the coefficient of variation (when data is available), we compare the market's delinquency data to the issuer's delinquent loan information, which most banks report regularly (ideally based on a 90-days-past-due definition). We use available data to establish a dynamic relation for adjusting the synthetic vintage data. We may use representative information on cover pool exposures or borrowers to establish default and loss distributions. Product- or borrower-specific default drivers will, for example, consider:

- The financed property type (e.g. owner-occupied versus buy-to-let);
- Whether the property is used for residential or commercial purposes (and the type of commercial property);
- The repayment type (amortising versus interest-only); and
- The property's loan-to-value ratio.

Depending on underwriting practices in the relevant country (when data is available), we may also use borrower-specific default drivers based on the debt-to-income ratio, employment status, age, or employer type. We may use such information to further differentiate the borrower's default risk.

4.2. Recovery rate assumptions

We calculate the security value as the stressed value of the underlying residential real estate properties in order to infer mortgage loan recoveries. Our framework for the fundamental recovery analysis primarily involves but is not limited to: i) estimating the collateral's current value (typically by indexation); ii) applying a haircut to the asset's current value via market value declines (rating-distance-conditional); and iii) applying additional haircuts (e.g. fire-sale discounts, liquidity adjustments) and costs. Steps ii) and iii) are embedded in the total security value haircut.

When available, we substitute this approach with a statistical analysis of available recovery vintage data or alternative data on historical recovery rates of assets like those analysed.

[31] At a minimum we use performance information from the issuer's annual accounts.
[32] The coefficient of variation is defined as the standard deviation divided by the mean.

4.2.1 Market-value declines for residential and commercial mortgage collateral

Our fundamental approach to deriving property price assumptions involves three steps. First, we estimate long-term sustainable levels and a sustainable growth rate (SGR) for nominal property prices, incorporating information embedded in metrics relating to property affordability, property profitability, private-sector indebtedness, the credit cycle, population dynamics, and long-term macroeconomic performance. Second, we deflate nominal prices using the sustainable growth rate and calculate the average historical SGR-deflated price. Lastly, we analyse the historical volatility of the SGR-deflated-price time-series to derive distance-conditional market-value decline assumptions.

The base case market-value decline captures the distance between current and historical average SGR-adjusted prices and factors in current market conditions (e.g. credit expansion or credit contraction). It allows for the possibility of a slow reversion to mean prices. As a result, a base case market-value decline may not necessarily reflect the distance between the current price and the historical average. The market-value declines we assume for the highest stresses capture the distance from the current SGR-deflated price to the average historical SGR-deflated price, plus an additional stress to capture historical price volatility. This stress level is typically based on two standard deviations from the average historical price. We may apply higher stresses and market-value-decline caps or floors to address data limitations, such as non-stationarity or too short historical time series.

The market-value declines apply to indexed property values according to the relevant house price indexation curves. Hence, our analysis considers any price corrections to date.

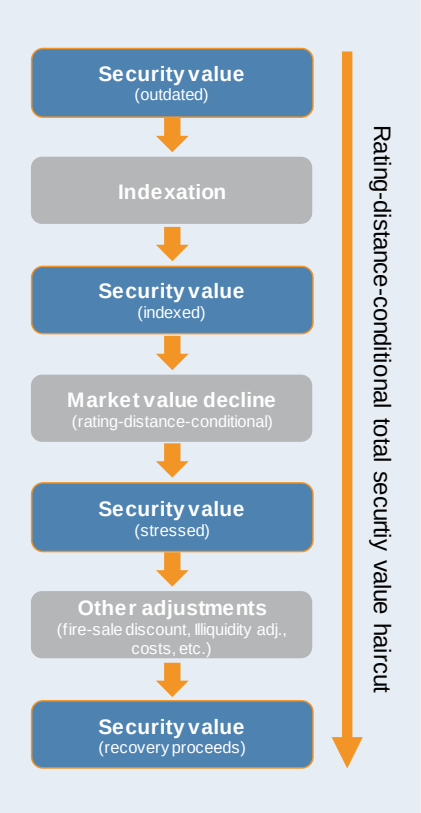
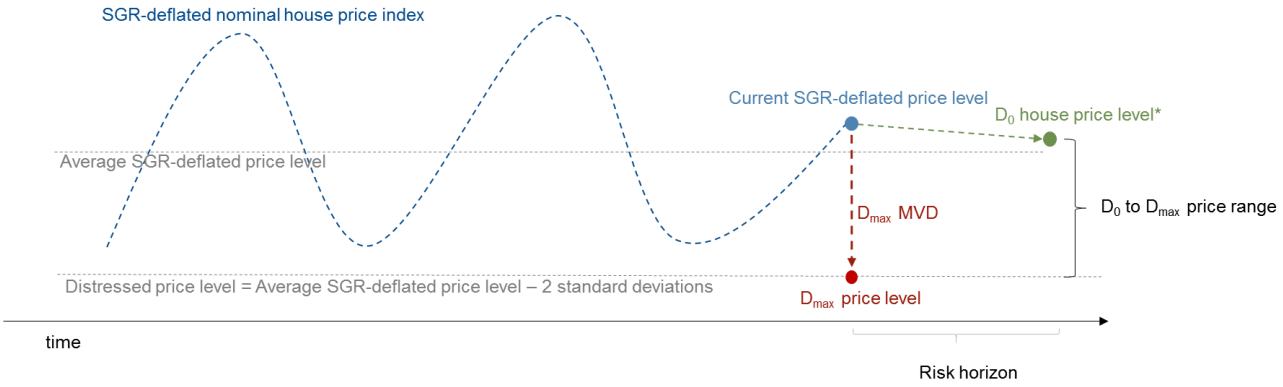


Figure 4. Market-value-decline analysis



* In this example, we assume that property prices will not fully revert to average prices, because the market conditions over the programmes risk horizon are expected to be supportive of nominal real estate prices (for instance due to expansive credit conditions or positive market sentiment).

The analysis of recovery rates for commercial real estate mortgages is also based on updated indexed values of the properties securing the loans. Our line-by-line recovery analysis for commercial real estate loans is aligned with the market-value-decline analysis for residential properties, provided that the granularity of available information is also high.

We may, however, apply an additional haircut to reflect the lower liquidity or quality of commercial assets, as illustrated in Figure 5 below. On average, these fixed market-value declines translate into fire-sale discounts that materially exceed those derived from detailed information on the obligors and the commercial properties securing the loan.

Figure 5. Additional fire-sale discount (FSD) for commercial real estate

$$Available\ money = [Appraisal \times (1 - MVD) \times (1 - FSD)] \times (1 - Additional\ CRE\ FSD)$$

4.2.2. Recovery rate tiering

The recovery rates generally decrease as the distance between the issuer and the covered bond rating widens. This also ensures that covered bonds with a stronger credit quality can withstand more volatile realised recovery rates.

Figure 6 provides an example of indicative recovery rate haircuts that we use and where the base case recovery analysis makes use of stratified portfolio information. If we assume that the base-case recovery rate is 50% and portfolio losses are analysed under highest stresses, the maximum stressed recovery rate would be 30% = 50% x (1-40%).

Figure 6. Indicative recovery rate haircuts for a maximum rating differentiation

Rating stress	D_0 (base case)	D_{max}[33] (stressed)
Haircut	**0.0%**	**40.0%**

For cover pool analyses on a loan-by-loan basis, we apply rating-distance-conditional market-value declines. The highest market-value declines range between two and three standard deviations for D_{max} stresses. Such severities are similar to those applied for the highest achievable ratings in structured finance.

4.2.3. Recovery timing

For residential mortgage assets, we generally assume a 24-month recovery lag following loan default. The figure may reduce to 18 months for highly liquid countries and regions in which foreclosure and collection processes are highly digitalised and efficient. On the other hand, inefficient foreclosure and collection processes or illiquid markets have a negative impact on the recovery timing. Mortgage loans ultimately guaranteed by a sovereign body may also result in a recovery timing assumption of 36 months or longer. When available, we consider statistical data.

5 Cash flow risk analysis

Our cash flow analysis includes a projection of defaults and loss-given-default from the cover pool. The main credit-related parameters include default distribution, the amortisation profile, default timing and recoveries as well as recovery timing. The analysis also incorporates market-scenario parameters such as different interest-rate and foreign-exchange term structures as well as stressed refinancing assumptions. The same concept of rating-distance-dependent stresses are applied to market risk factors such as interest-rate and foreign-exchange risks as well as the liquidity premium[34].

5.1. Interest-rate and foreign-exchange risks

We test the resilience of the covered bond structure against adverse interest-rate and foreign-exchange developments. Our rating analysts use a set of deterministic, adverse interest-rate and foreign-exchange-rate scenarios to identify the scenario that most severely impacts expected loss, as shown below.

The current interest forward rates are the starting point in the cash flow analysis. Analysts modify the expected rate developments at starting points of between year two and year 10 of the residual life of the covered bonds.

Interest rates are then either increased to a stressed rate of 10% and/or dropped to a rate of minus 1%.

For both upwards and downwards scenarios, the stressed rates are maintained for a period of two years, after which they start to revert to what we expect to be a long-term mean interest rate.

We complement these rate developments with ‘lower for longer’ and ‘higher for longer’ scenarios in which the interest rate remains at a negative 1% or positive 10% until the pool has matured. We also test against a scenario that constantly rises to 15% (including a spike of up to 20% for a relatively short time), after which rates revert to a long-term mean assumption.

[33] Rating stresses for scenarios between D_0 and D_{max} are determined by linear interpolation.
[34] See Appendix II, 1. ‘Determining the Covered Bond’s Expected Loss’, ‘Rating-Distance-Dependent Stresses’.

Figure 7. Rising interest rate forward curves

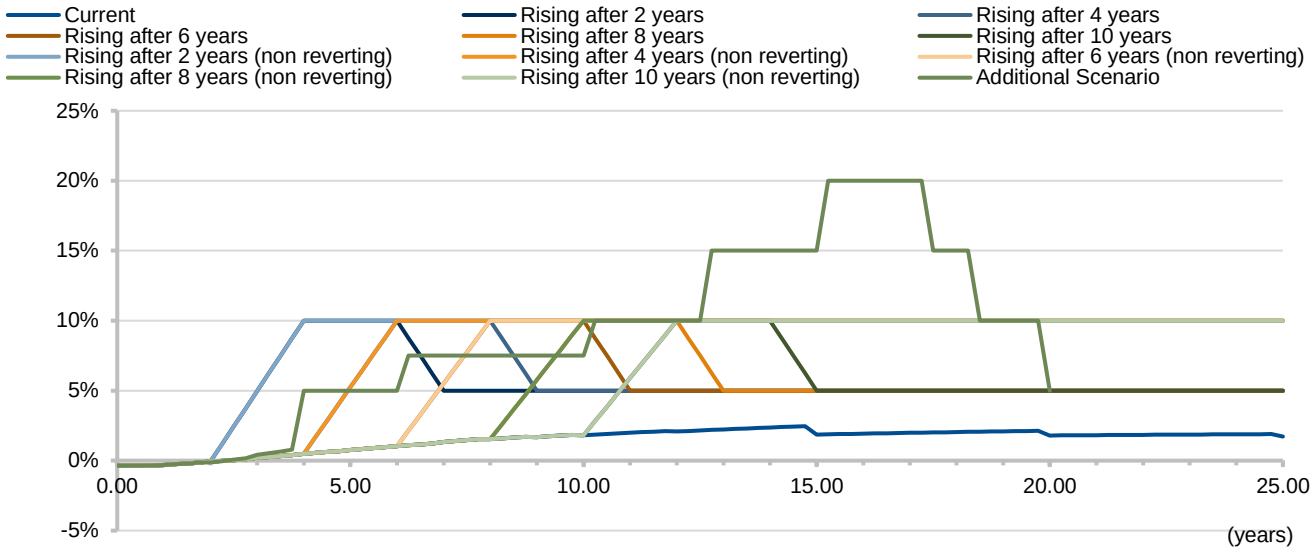
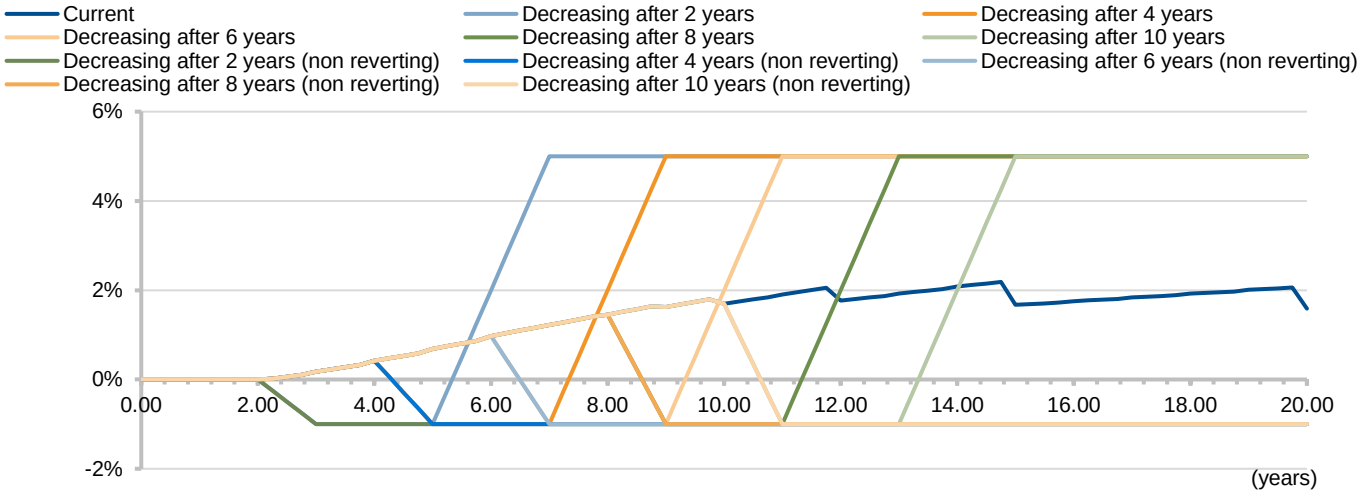


Figure 8. Decreasing and lower-for-longer interest rate forward curves



We dynamically stress the current exchange rate to the all-time lows and highs of the respective currency pairs observed since 1953. For the maximum stressed projection of the foreign-exchange rates during the first year, we apply the minimum and maximum annual changes for the relevant currency pairs. Within the next two years, the rates are projected to linearly move to their historical high (low). After year three, the stresses remain constant. Depending on the cover pool's composition and whether there are more foreign-currency assets or liabilities, we test the cover pool's resilience against either a rise or fall in the relevant currency.

5.2. Asset sale

We assume that projected liquidity shortfalls can be covered by asset sales. The amount of asset sales needed is determined by calculating the net present value of a cover pool's projected performing cash flows $CF(t)$, which we convert into the base currency with a projected exchange rate $r_{FX}(t)$ when applicable. We establish the relevant discount factors using the scenario-specific discount curve, to which we add a cover pool-specific liquidity premium (see 4.3 below).

We construct the scenario-specific discount curve with simple compounding using the day-zero expected forward curve. The net present value at period k with compounding interval $\Delta(t_j)$ is calculated as:

Figure 9. Net present value of the cover pool

$$\sum_{i>k} \prod_{j=k}^{i-1} \frac{1}{1 + r_{forward}(t_j)\Delta(t_j)} r_{FX}(t_i)\, CF(t_i)$$

Interest rate stresses are applied consistently by shifting the discount curve in parallel so that the day-zero forward rate of the discount curve matches the corresponding forward rate $r_{forward}(t_k)$.

5.3. Asset liquidity premiums

The asset liquidity premiums we add to the discount curve reflect the different risk perceptions among investors for a given asset type as well as the differences in fungibility and market depth. Generally, the lower the asset pool granularity and the lower the turnover for an asset type, the higher the liquidity premiums. Figures 10 and 11 provide our general assumptions for asset-specific liquidity premiums. The analysis may deviate from the below guidelines if we observe very significant liquidity shortfalls or an issuer has to repeatedly sell assets over a prolonged period, among other factors. When modelling asset sales, we assume asset selection to be unbiased. The cover pool-specific liquidity premium reflects the weighted average spread for the respective asset types[35].

5.3.1. Public-sector liquidity premiums

We determine the public-sector asset premiums by analysing stressed credit spreads (iboxx) or credit default swap spreads (CDSs; five-year or 10-year CDSs) specific to the respective country and/or public-sector obligor. The observation period typically covers the recent sovereign crisis, which affected most sovereigns, as well as periods during which idiosyncratic or geopolitical events put pressure on trading spreads. Analysts also account for the observed volatility of trading spreads, which often also indicates the existence of secondary-market liquidity. The grouping of countries and asset types reflects our general view on the credit quality of the sovereign and its lower public-sector tier exposures, including the relevant guarantee structures.

[35] In a high interest rate environment, credit risk and liquidity premiums could widen in absolute terms while relative relations might remain intact. We regularly review the liquidity premiums as well as the relative ranking of countries and will amend assumptions as necessary.

Figure 10. Indicative maximum liquidity premiums for public-sector exposures

Group	Countries	Tier 1: sovereign	Tier 2: sub-sovereign	Tier 3: lower-tier sub-sovereign	Tier 4: public-sector corporates (guaranteed)	Public-sector covered bonds	Public sector with guarantee of subsovereign
1	Germany, Finland, Sweden, Norway, Switzerland, US*	100	150	200	250	150	150
2	Netherlands, Japan, Canada, multinational	150	200	250	300		
3	Austria, France,	200	250	250	300	200	250
4	Belgium, Eastern Europe (Poland)	300	350				
5	Italy, Iceland	500	550	600			
6	Hungary, Spain	600	650				
7	Non-investment grade countries	1,200	1,250		1,250		

In general, the higher the premium, the lower, smaller and often less liquid the market for the respective exposure is. Using the sovereign premium as the anchor, we generally add 50 basis points for lower-tier public-sector exposures and differentiate between the sovereign (tier 1), federal states, departements or regions (tier 2), municipalities, regional or inter-departmental organisations (tier 3), and municipal- or regional-guaranteed corporations (tier 4). For example, the liquidity premium for a Group 1 municipality-guaranteed utility (tier 4) is generally 250bps. This is derived by adding the group-specific sovereign premium – 100bps for tier 1 – to their respective tiers, 50bps (tier 2) + 50bps (tier 3) + 50bps (tier 4).

The weighted average pool-specific liquidity premium is based on the current pool composition and added to the discount curve. We apply this liquidity premium through the lifetime of the covered bond structure, scaling linearly between the current premium (D_0) and the spreads commensurate with the relevant rating distance.

5.3.2. Mortgage asset liquidity premiums

We follow a similar approach for mortgage cover assets. For example, our reference point for plain vanilla residential mortgages is the development of country-specific trading spreads (e.g. Iboxx indices) for mortgage-covered bonds comprising the same asset type. If a mortgage cover pool's composition tends towards a specific product (e.g. residential vs commercial mortgage assets) or customer types (owners vs buy-to-let borrowers), we base our assumptions on the development of trading spreads for market-placed securitisation transactions or indices with similar asset types. For example, we often analyse small-ticket commercial mortgage exposures based on secondary-market trading spreads of the highest-rated tranches of SME transactions.

Figure 11. Indicative maximum liquidity premiums for mortgage assets in cover pools

Collateral type	Residential mortgages		Commercial mortgages	
in bps	From	To	From	To
Austria	150	250	300	500
Denmark	100	200	300	500
France	150	250	300	500
Germany	100	200	300	500
Norway	100	200	300	500
Poland	400	700	400	800
Portugal	500	800	600	1,000
Spain	250	450	300	700
Sweden	100	200	300	500

We apply the same liquidity premium over the life of the covered bond transaction. As the stressed economic environment is not expected to persist until the last covered bond matures, we generally do not use the highest-observed trading spreads. Cover pool-specific adjustments may also reflect the length of time for which a cover pool depends on asset sales. We believe a more moderate stress can be applied through the transaction's remaining life if a cover pool has an ongoing need for asset sales over an extended period (generally more than five years),[36]. The premiums are calibrated to allow for a stressed fire sale that provides the cover pool manager enough time to set up an orderly sale, through which the value of the mortgage loans – often a key way to maintain customer relations – can be maximised.

5.3.3. Other cash flow assumptions

Prepayment rate assumption

The covered bond structure's resilience is tested against constant prepayment rate (CPR) assumptions. Covered bond structures are often most sensitive to a very conservative 0% assumption, and we use this as a central base scenario for cover bond programmes with longer asset maturities. Higher prepayment assumptions generally benefit the cover pool analysis as they increase cash accumulation, inter alia, reducing the need to monetise parts of such pools. We also test the covered bond programme's risk profiles against higher prepayment rates. A high CPR assumption is typically 15% – unless those observed on the market are significantly higher. We may change our approach if justified by a specific asset type or certain macroeconomic expectations (e.g. changes to interest rates) or changes to the loan products, which would make it more or less costly to prepay.

[36] A wind-down of a cover pool might take 20-30 years, and weak economic environments, during which the highest trading spreads can be observed, often have not persisted for such long periods.

Servicing fee

We apply servicing fees specific to the country and asset type that the cover pool has to pay annually: 10 bps for a pool of less complex public-sector cover assets and higher fees for mortgage assets, e.g. 25 bps to the residential segment and 50 bps for the commercial segment (including developers and land). We may lower the servicing fee for very large cover pools that benefit from economies of scale (typically above EUR 10bn) or increase the servicing fee for more complex cover pools (e.g. cover pools comprising significant shares of export credit agency-guaranteed exposures).

Appendix III Technical note on Scope's covered bond expected loss model (CobEL)

Scope's CobEL model implements the calculation of a covered bond's expected loss as described in Appendix II above. The expected loss is determined via a numerical integration of the losses under different default rate scenarios, weighted with their respective probability. The algorithm naturally separates into a cash-generating part and a cash-consuming part – each will be described below.

1 Asset treatment

The model assumes perfect granularity and homogeneity of the asset pool. Assets will generate future cash flows, according to assumptions for interest and amortisation payments as well as for prepayments, defaults, recoveries, asset cures and other market parameters, such as foreign-exchange and interest rates. Asset assumptions are specific to the analysed covered bond and recorded as vectors.

In the simulation, cover pool assets are considered as either performing, delinquent or defaulted. Performing assets pay interest and amortise according to a specified schedule. Defaulted mortgage assets are excluded from the asset balance and the assumed recovery will be distributed over time according to a defined recovery schedule. Defaulted public-sector or substitute assets are also excluded from the asset balance. However, following their workout period, assets are reinstated but proportionally reduced with the assumed recovery rate.

Assets normally do not change directly from performing status to default but rather undergo a period of delinquency. Delinquent assets can fully or partially cure before defaulting. We generally assume a level of liquidity stress by considering that a certain percentage of assets may become delinquent and cure, i.e. become performing again and pay previously missed payments after a moratorium period, before defaulting.

The performing asset balance for each currency and in each period undergoes the following sequence:

1. Add back cures or recoveries to the opening performing mortgage asset balance
2. Reinstate public-sector or substitute assets at the assumed recovery rate for such assets
3. Subtract new delinquent assets from the opening performing balance
4. Calculate interest specific to the asset type over the period based on the resulting performing asset (steps 1 to 3) and cash balances
5. Subtract prepayments over the period
6. Subtract amortisation over the period
7. Remove sold assets from the performing balance

By default, each period corresponds to a calendar month except if the transaction's time-related characteristics need adjustment.

2 Liability treatment

Scope's CobEL model has a very flexible description of the priorities of payment for the different covered bond structures. The model features a set of accounts that keeps track of outstanding liabilities and received or paid cash amounts. The model allows for the analysis of not only hard- and soft-bullet covered bonds but also securitisation-like pass-through structures (CPTs).

The available cash is used to pay interest and servicing fees and repay maturing covered bonds. The bonds are paid pro-rata. In the case of multi-currency pools, cash flows are converted into the corresponding foreign-exchange rate at the time of the event. If cash is insufficient to repay principal, interest or expenses, assets are sold based on the present value at the simulation time and considering additional discounts to allow for timely payment. The performing asset balance is then proportionally reduced to reflect the asset sale.

3 Other functionalities

CobEL allows to systematically identify and apply the interest-rate and foreign-exchange stress scenarios to which the covered bonds are most sensitive. The model creates the stress scenarios as described in the methodology using a generic distortion parameterisation of the input curves.

The model also calculates the required breakeven overcollateralisation for a given rating by applying a line search algorithm, performing a full re-calculation for each parameter change.

Appendix IV Limited cover pool analysis

For highly rated issuers whose covered bond programmes already achieve AAA ratings based on fundamental credit support (fundamental support-based covered bond ratings), the cover pool analysis does not constitute a rating driver. For such programmes we generally only perform a limited cover pool analysis with the aim of identifying whether the cover pool could stabilise the rating in the event of a one-notch issuer downgrade[37].

At the least, we will perform a detailed cover pool analysis upon a downgrade of the issuer below a level that no longer supports the highest rating based solely on fundamental support. We analyse the same risk factors in both limited and detailed cover pool risk analyses. As the cover pool is not needed to support the assigned rating, the limited analysis is simplified, however.

This analysis assesses whether, under conservative assumptions, covered bonds are highly likely to be repaid in full. It does not result in an expected loss assessment for the covered bond programme.

1 Qualitative assessment of asset credit risk

Our assessment will focus on a qualitative evaluation of key asset-quality metrics such as the composition of the cover pool, relevant loan-to-value ratios, as well as the level and development of non-performing loans. Analysts will benchmark the available information with those of other issuers in the market. Based on public information (such as the protection levels for covered bonds or securitisation transactions with similar asset types), we will translate this qualification into the overcollateralisation needed to fully cover identified credit risks. Based on the resulting level of overcollateralisation, asset credit risk is classified as either low, medium or high.

Figure 1. Asset risk classification guideline

Classification	Overcollateralisation to absorb credit risk
Low	0% to 15%
Medium	15% to 30%
High	30% and above

2 Cash flow risk assessment

The identification of relevant market and refinancing mismatches are key for this assessment. We apply a significant stress to identified mismatches to determine the additional overcollateralisation needed to support full payment. We use the scheduled cash flows but will adjust for factors such as scheduled and unscheduled amortisations (e.g. if only final maturities are reported, prepayments) or the scheduled maturities (taking into account soft-bullet extensions).

2.1. Sizing the overcollateralisation for maturity mismatches

Figure 2. Worked example: sizing mismatch risk

Assumption: Cover pool volume: EUR 910m; outstanding covered bonds: EUR 700m; overcollateralisation: 30%

	0-1 year	1-2 years	2-3 years	3-5 years	5-10 years
Asset maturities	100	75	150	200	385
Carryover from previous period	-	0	0	50	
Covered bonds due	100	100	100	300	100
Net	-	-25	50	-50	285
Assets that need to be sold (at 50% of par)		50		100	

[37] We may also publish a detailed cover pool analysis for fundamental support-based covered bond ratings even though it is not a rating driver.

In the above example, we take the provided amortisation schedule and identify whether, in the respective time buckets, asset redemptions can fully meet maturing covered bonds. This example assumes that fixed assets need to be sold at 50% of the par value of the cover assets.

We allocate EUR 150m or 21.4% of available overcollateralisation to cover maturity mismatches. We use stressed fire-sale proceeds of 70% for floating-rate cover assets and 50% for fixed-rate cover assets.

We also identify existing interest-rate or foreign-exchange mismatches and establish the additional overcollateralisation needed to fully mitigate the identified risk.

2.2. Sizing overcollateralisation for interest-rate mismatches

We determine the interest rate-driven contribution to overcollateralisation by multiplying the difference in the interest type mismatch (difference of percentage of fixed-rate assets and fixed-rate bonds, or floating-rate assets and floating-rate bonds) with a given interest rate movement. We then multiply the result with the absolute difference between the weighted average life of the cover pool and the covered bonds.

The following figure illustrates the test for interest rate movement. A 'high' scenario is more relevant when there are more floating-rate covered bonds than floating-rate cover assets. We would select a 'low' scenario when more floating-rate assets than floating rate covered bonds are available.

Figure 3. Stressed interest-rate movements

Scenario	Interest movement
Low	-2%
High	5%

Figure 4. Worked example: allocation of interest-rate overcollateralisation

Example no.	Interest type mismatch	WA life gap	Scenario	Interest rate movement	Additional OC
1	20.0%	1.0	**High**	5.0%	1.0%
2	50.0%	3.0	**High**	5.0%	7.5%
3	60.0%	5.0	**High**	5.0%	15.0%

Formula	Mismatch * Gap * Interest rate movement

2.3. Sizing overcollateralisation for foreign-exchange mismatches

Foreign-exchange risk arises if the programme is not fully hedged against foreign-exchange risk and the cover assets or covered bonds are denominated in multiple currencies. We address this risk by allocating additional overcollateralisation for an appreciation or depreciation of the relevant currency pair by 50%.

Figure 5. Worked example: foreign-exchange risk contribution to overcollateralisation

Currency	Cover assets (EUR)	Covered bonds (EUR)	Appreciation / Depreciation	Adjusted assets	Adjusted bonds
Euro	75%	70%	0%	75%	70%
US dollar	10%	15%	+50%	15%	23%
Swiss franc	5%	10%	+50%	8%	15%
Norwegian krone	5%	0%	-50%	3%	0%
Swedish krona	5%	5%	0%	5%	5%
	100.0%	100.0%	**Total**	105.0%	112.5%
			Overcollateralisation	**7.5%**	

3 Overcollateralisation test

To identify whether available overcollateralisation can cover identified risks, we first assess the availability of overcollateralisation provided and identify a sustainable level in line with section 4.2.3 ‘Availability of Overcollateralisation’. Next, we establish the supporting level of overcollateralisation by adding the level needed to mitigate identified risks. We compare available overcollateralisation to the supporting level to determine the likelihood that a covered bond is repaid in full. A committee then concludes whether additional cover pool support can stabilise a fundamental support-based cover pool rating in the event of an issuer downgrade.

3.1 Worked example: comparison of overcollateralisation

A cover pool comprising residential mortgages whose loan-to-value ratio and credit risk have been classified as low can translate into an overcollateralisation contribution of 7.5%. Adding all the additional overcollateralisation components, the supporting overcollateralisation that would cover the identified risk equates to 37.4% (= 7.5% credit + 21.4% mismatch + 1% interest rate + 7.5% foreign exchange). Compared to the available overcollateralisation of 40%, the cover pool is very likely to support an additional notch.

In the above example, assuming an issuer’s Outlook changes to Negative and ratings are based solely on fundamental support, the above overcollateralisation can help maintain a Stable Outlook for the covered bond rating. Based on the above, the cover pool is very likely to support an additional uplift, providing rating stability. If a rating committee cannot gain enough comfort on the permanence of the provided overcollateralisation, it may place the covered bonds on a similar Negative Outlook.

Appendix V Liquidity risk mitigation

For the most part, covered bond issuers do not eliminate, but rather mitigate, a covered bond's refinancing risk. Provided mitigants can result in a higher cover pool uplift (see section 1 below) and/or impact the cash flow analysis.

1 Conditional pass-through structures

Most covered bonds are repaid as a bullet payment on the scheduled due date under a going-concern assumption, potentially also under a gone-concern assumption. Conditional pass-through (CPT) covered bond structures employ tests to avoid a repayment-driven event of default for a covered bond, making the full repayment on the scheduled due date conditional. If the servicing of payable amounts is no longer possible as per the schedule, the repayment method switches to pass-through[38]. In this case, the cover pool's available proceeds will be allocated pro rata to the outstanding covered bonds according to a predefined waterfall. Instead of being paid on the scheduled due date, investors will receive interest and principal up to the (extended) final legal maturity date. As is typical for securitisations, the legal maturity date will be determined by considering the longest-dated assets; it will also include a workout period so that, if repayment depends on repaying the last asset, even a default and subsequent workout would not threaten the ultimate repayment of the principal.

The structural setup of a CPT covered bond, in particular how strongly material changes in credit and market risk factors are contained during the replenishment period, will determine the maximum rating distance between its issuer and the CPT covered bonds. If the covered bond structure can fully carve out bank issuer risk, the covered bond can in principle be rated the same as a comparable securitisation transaction – fully delinked from the cover asset originator. However, as risk profiles in CPT structures only become static after an issuer's default, we expect strong continued dependency on the bank issuer. The extent to which the CPT covered bond rating uplift can differ from that of a hard- or soft-bullet covered bond programme will depend on its individual terms and conditions.

2 Soft-bullet structures

Traditionally, soft-bullet structures permit an extension period (usually 12 months) for hard-bullet payments, which aims to reduce the likelihood of a covered bond default event. The extension period allows the cover pool manager to either accrue additional repayments during the extension, or to more efficiently monetise cover assets to meet the payment on the extended final due date.

We review the structures presented and incorporate the extent to which we consider them to mitigate repayment risk in the quantitative analysis.

Pre-maturity tests only require issuers to pre-fund redemptions that become due in a given period (also usually 12 months). Highly rated issuers often provide conditionality as well, since they will only have to fund the corresponding reserve if they fail to meet rating thresholds like those applied for liquidity lines.

Similarly, some covered bond laws require tests, such as the pre-maturity test, to cover the cumulative outflow for a predefined period, typically six months. Readily available liquid assets that can cover identified shortfalls would have to provide a buffer to the outflow.

[38] No CPT market standard has evolved to date. The only common feature is that any switch from a hard-bullet repayment obligation to a pass-through structure will need to be triggered by the breach of an objective and pre-defined test. For some programmes, the switch can already be triggered when the issuer has not yet defaulted. For other programmes, a switch can only be triggered after the sponsor's default. For example, between an issuer's default and the breach of an amortisation test, the cover pool administrator might be asked to maintain the hard-bullet repayment for as long as possible by selling cover assets – until such sales are no longer possible. Further, and depending on the individual CPT documentation, the breach of an amortisation test might only impact the next covered bond due. Alternatively, all remaining series might need to switch simultaneously to a pass-through repayment structure. Because of the currently observed divergences, the benefits of a CPT structure for the covered bond rating have to be assessed on a case-by-case basis.

3 Other forms of liquidity risk mitigation

The ability to register liquid or so-called substitute assets in the cover pool can also mitigate liquidity risk. In some countries, the legal obligation to match liquidity shortfalls with substitute assets within a predefined period (typically 180 days) can provide a cover pool manager with tangible means to avoid a covered bond default. The sole ability to register such assets is, in our view, less effective, as the amount needed is not further specified and issuers often do not voluntarily provide such assets – particularly in times of distress. This also holds true if issuers are only informally obliged to perform active liquidity management.

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