Creditreform Rating AG Rating Methodology

Covered Bond Ratings

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Version 1.0

Creditreform Rating

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1 Introduction

Over the past 17 years, Creditreform Rating AG (“CRA“, “Creditreform Rating”), established in 2000, has become one of Europe’s leading rating agencies.

In this document, CRA discloses its rating methodology for the rating of covered bonds in order to provide the parties involved, investors and the wider public with the opportunity of developing a deeper understanding of the mechanisms behind its ratings. This document will be regularly upgraded to reflect any changes in our methods and philosophy. The CRA rating methodology and Code of Conduct can be freely accessed on our web page (www.creditreform-rating.de).

Covered bonds are typically issued by banks under specific covered bond legislation or by using contractual documentation to replicate the features commonly found in such legislation. Investors in covered bonds have dual recourse to the financial institution behind the covered bond program (the covered bond issuer) and to the assets in the cover pool. These criteria use the terms "issuer" and "covered bond issuer" to refer to a financial institution that sponsors a covered bond program, although the actual issuer may be a special-purpose entity (SPE) or a specialized lender, for example. However, in this case, any reference to a "rating on an issuer" reflects the creditworthiness of the actual issuer, which incorporates any group support from the sponsor. The asset cover pool typically includes residential or commercial mortgage loans, or public-sector assets. Covered bonds are usually issued on an ongoing basis.

Creditreform Rating’s covered bond ratings are performed taking into account all available and relevant information in order to quantify the risks of the issue at hand. CRA arrives at its conclusions by applying a rating method that combines quantitative and qualitative approaches. In contrast to the rating of a covered bond issuer, covered bond ratings place a specific emphasis on the legal framework and structural elements of the transaction, the assessment of liquidity- and refinancing risks and quality of the cover pool and available collateralization and credit enhancements.

Covered bond ratings represent well-informed assessments of a given emission’s “credit quality“. They do not represent a recommendation to purchase, sell or hold financial instruments. Neither are they legal opinions, and they provide no independent valuation of the future market values of individual assets and / or investments in the issuer’s possession.

2 Scope of Application

The CRA "Rating of Covered Bonds" rating methodology serves as a general framework for the rating of covered bond programs. Specific jurisdiction- and program-specific extensions and modifications of the rating approach outlined here will be based on an evaluation of relevant facts (i.e. legal framework assessment, novel asset-classes, structural features etc.) and will be referenced in a particular rating report.

Covered bonds are dual-recourse instruments. Timely and full payment of interest and principal is typically secured by reference to (1) the issuer under the program, normally a financial institution, and (2) a cover pool of assets, both serving as alternative sources of funding. Recourse to the cover pool will only arise if legal, regulatory and jurisdiction-specific support mechanisms (such as the EU´s Bank Recovery and Resolution Directive, 2014/59/EU) have been exhausted, the issuer´s business can no longer be continued and the restructured or resolved financial institution defaults with respect to the servicing of the covered bond´s debt.

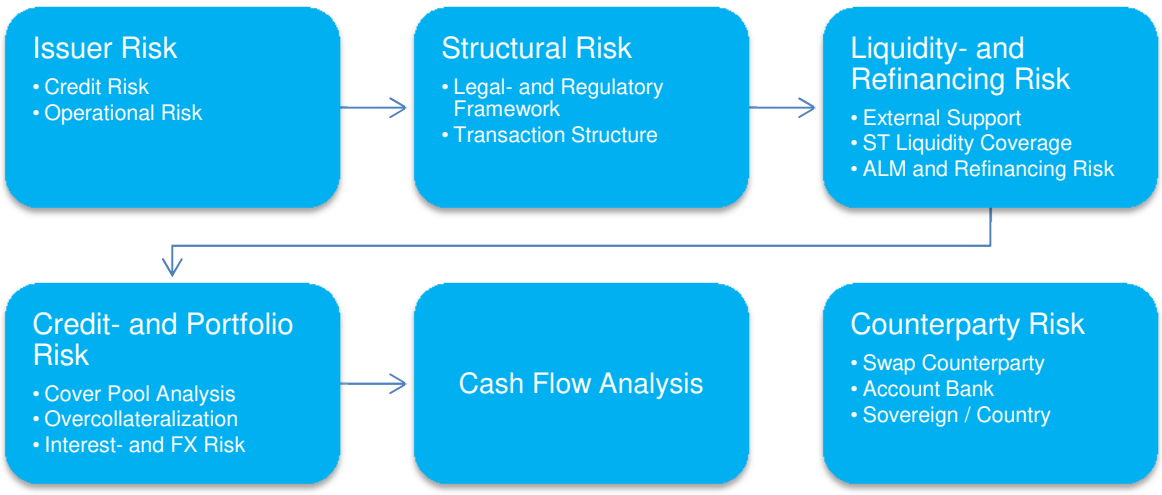
As they are typically exempt from bail-in, covered bonds benefit from enhanced protection against financial distress of the issuer, offering bond holders a preferential claim over cover pool assets as well as a residual claim on the issuer´s insolvency estate. This preferential treatment of covered bonds is typically encoded in national and/or supra-national legislation.

3 Rating Methodology

3.1 Rating Approach

Risk Factors in Covered Bond Ratings

A covered bond rating is based on the analysis of several domains of risk typically associated with the issuance of covered bonds: (1) issuer risk (2) structural risk, (3) liquidity- and refinancing risk, (4) credit- and portfolio risk, (5) analysis of cash flows and (6) counterparty risk.



The starting point of the CRA covered bond rating is the assessment of issuer-related risks. In particular, our assessment of the issuer´s credit quality – its capacity to service covered bond debts as a going-concern – will serve as a rating floor to the covered bond rating and likewise indicate the need for recourse to structural safeguards and the cover pool.

The analysis of the legal and regulatory framework, as well as the particular transaction structure laid down in the contractual documentation will provide a perspective on the structural risks of the covered bond program. As detailed further below, a set of minimum requirements will determine whether the covered bond rating will be eligible for a notching uplift from the rating floor. A key aspect in this regard is the effective segregation of cover pool assets from the issuer´s insolvency estate, regularly stipulated through national legislation and covered bond frameworks.

In analyzing liquidity- and refinancing risk, we scrutinize whether the liquidity requirements of a covered bond program are likely to be met, including the servicing of interest and principal of the issued covered bonds. Liquidity risks are often addressed by legal- and regulatory risk management provisions, and can be further mitigated by external support mechanisms. External liquidity support may be provided by reserves and credit facilities (including credit lines and facilities of the issuer and related entities) or obtained through funding from capital markets. Due to the often long-lived nature of the cover pool assets, covered bonds typically experience asset-liability mismatches (ALM). Our analysis of refinancing risk addresses the fundamental concern that a covered bond, when due, cannot be redeemed in full. Mitigants may be structural, such as redemption schemes or contractual OC level requirements, but may well be addressed by legal- and regulatory and external support mechanisms. The analysis of liquidity- and refinancing risk will determine the primary uplift of applied to the covered bond rating floor.

The secondary uplift will be derived from our assessment of credit- and portfolio risk in combination with an analysis of the structure´s cash flows. To assess the cover pool´s ability to yield sufficient funds in order to meet the obligations of covered bonds on a timely basis after a switch to the second recourse, we scrutinize the credit quality and cash flow characteristics of the cover pool assets. This includes an assessment of asset credit risks, i.e. deriving assumptions of default probability and recovery prospects, in order to delineate whether available collateral can be monetized at stressed market prices during adverse economic conditions to pay maturing covered bonds. These results will inform our cash flow model, in which we test the structure´s ability to perform and service the covered bonds in particular rating stress scenarios. The rating of the cover pool will determine the secondary uplift applied to the covered bond rating floor.

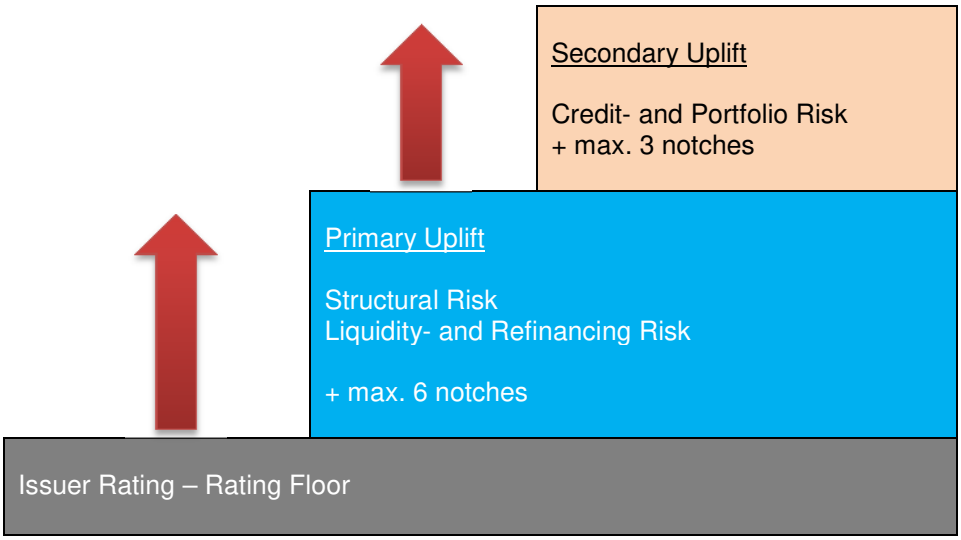
Other risks, in particular with respect to counterparties, will be taken into account in the final rating. The identification of significant counterparty risk may also provide reasons to deviate from the combined uplift determined in the preceding stages.

Notching Framework

Our assessment of issuer-related risks expresses a covered bond rating floor and point of departure for two rating uplifts which reflect the regulatory architecture and quality of the cover pool as a second recourse. In Europe, we consider the legal framework and dedicated bond legislation present in many jurisdictions an important driver and mitigant of transaction-related risks because recourse to the cover pool will normally effected under rare circumstances only, i.e. if regulatory supervision has failed, protection from regulatory capital and bail-in-able debt is insufficient to guarantee program continuation and, following an attempted restructuring, the resolved bank becomes insolvent. The degree of protection provided by legal and regulatory frameworks is reflected in **the primary uplift of up to six notches** above the issuer rating. CRA uses a scoring system to determine the strength and weaknesses of the relevant legislative framework(s) with respect to structural risks and effectiveness in mitigating liquidity- and refinancing risks, as described further below.

We then take into account the second recourse, i.e. the quality of the collateral and cover pool and determine **the secondary uplift of up to three notches** additive to the primary uplift. The rating levels and associated stress factors and multipliers relevant to the assessment of credit- and portfolio risk and our cash flow model will be sized relative to the intermediate covered bond rating including the primary uplift.

The final rating will include and take into consideration our assessment of counterparty risks relevant to the transaction and be subject to the decision of a rating committee to which the analysts present the results of the rating process.



3.2 Issuer-Related Risks

In our rating of covered bonds, the issuer long-term rating, i.e. the creditworthiness of the issuer, is an authoritative reference point serving as a rating floor. If the issuer has no long term rating but the parent company does, then CRA will use the parent rating as a rating reference point – if the investment is 100% or the probability is very high that the issuer is supported by the parent company in the event of payment difficulties. The probability of support depends on a variety of factors, including a common jurisdiction, agreements on profit transfers, a uniform branding and interdependency in the business model or refinancing. If the covered bonds are a full recourse debt instrument, then as long as the issuer is solvent, the covered bond obligations will be serviced regardless of the development of the cover pool.

The issuer long-term rating also encompasses an assessment of issuer-related operational risks. For example, the issuer sets and maintains lending and loan origination standards. The issuer also manages the cover pool composition, influences asset- and liability-mismatches and can set the overcollateralization level of the pool above legal requirements or contractual commitments. The issuer must have installed risk management systems to identify and control the relevant risks such as interest rate- , currency and market price risks, or operational and liquidity risks. The discretion must be sufficiently broad for the issuer to be able to counteract negative changes without breach of covered bond legislation or contractual commitments, for example in adding new assets of lower credit quality to the cover pool or entering new hedging contracts which change the hedging profile of the cover pool. Since the issuer normally also is the servicer of the underlying loans, CRA considers the presence of a back-up servicer a positive to the reduction of payment interruption risk following a default of the issuer and a switch to the second recourse.

For a detailed representation of the issuer rating see the Creditreform Rating bank rating methodology, available on our website (www.creditreform-rating.de).

3.3 Structural Risk

3.3.1 Legal and Regulatory Framework

Our analysis of structural risks focuses on the legal and regulatory framework governing the issuance of covered bonds in a particular jurisdiction. If such dedicated covered bond legislation does not exist, or if the issuer issues outside of the existing legal framework, then our analysis reflects the particular contractual arrangements agreed upon between the transaction parties. We identify important structural features such as independent oversight, effective asset segregation and preferential treatment in the case of issuer insolvency or resolution, mandatory credit-, market- and liquidity-risk management principles, requirements for overcollateralization and liquidity support and contingency plans. In addition, we scrutinize the terms and conditions of a particular covered bond program for enhancements and structural features designed to reproduce or complement the legal and regulatory framework.

Specialized covered bond frameworks have been put in place in most European jurisdictions and are typically designed achieve effective asset segregation from the insolvency estate of the issuer and (partly) mitigate credit-, market- and liquidity-risks. In Europe, national regulation is typically complemented by relevant EU-wide legislation such as the Bank Recovery and Resolution Directive (BRRD)[1], which establishes a framework for the recovery and resolution of credit institutions and investment companies. Covered bond frameworks aim at ensuring the ability to perform a seamless switch to the second recourse (the cash flows of the cover pool) in the case of an issuer default and the segregation of the cover pool from the insolvency estate, as well as granting holders of covered bond special privileges over the cover pool assets, which take precedence over claims of any other creditor in the case of issuer default.

In order to be eligible for a rating uplift, we expect a number of requirements to be addressed by legislation and/or the covered bond program. The results feed into our assessment of liquidity- and refinancing risk and the quantitative analyses of the cover pool. They may impact the primary and secondary rating uplift we apply to the covered bond rating.

Asset Segregation

A key aspect in the legal framework analysis is the effective segregation of cover pool assets from the issuer´s insolvency estate, which is a structural prerequisite to uninterrupted payments of interest and principal after a default of the issuer from the cover pool. The isolation of cover pool assets must be legally valid, binding and enforceable upon the issuer´s resolution or default, and, in the case of an off-balance-sheet transaction, be evidenced with a valid perfection of transfer and true-sale and an effective ring-fence of the special purpose vehicle (SPV). In general, we expect to review opinions from a legal counsel as to the effectiveness and enforceability of the covered bond holder rights.

Among the legal provisions we assess are the nature and effectiveness of asset segregation (on- or off-balance sheet) and whether cover pool assets will be used exclusively to service covered bonds or other *pari passu* obligations of the issuer. Of particular interest is the existence of statutory provisions regarding the going-concern status of the covered bonds upon regulatory intervention and whether or not covered bonds will be accelerated following a default. To further assess the bankruptcy remoteness of the program, we address how claims of the covered bond holders are protected against claims from other creditors (i.e. preferential claim by law, true-sale etc.) and whether covered bond holders will have recourse on the insolvency estate of the issuer upon a cover pool default. *Vice versa*, other creditors may exercise claims on cover assets that exceed the regulatory overcollateralization requirements of the cover pool and, in the event of an issuer default, these may have to be released into the insolvency estate of the issuer.

[1] Bank Recovery and Resolution Directive 2014/59/EU of the European Parliament and of the council of 15 May 2014.

Cover Pool Requirements

To ensure that high credit quality assets are included and maintained in the cover pool, covered bonds can only be backed with collateral meeting certain eligibility criteria. For example, legislation may limit permissible collateral assets to real estate mortgages, sovereign credits or certain types of other assets (i.e. ship or aircraft loans). The eligibility criteria of the cover pool as mandated by the legal and regulatory frameworks may include, among others:

- Permissible assets and types of covered bonds allowed
- Geographical limits of cover assets
- Percentage of foreign assets
- Type and level of LTV value limits and their determination
- Valuation requirements
- Type and extent of substitute assets
- Limits of program size

A special administrator and/or cover pool monitor may be appointed by the regulatory body or the issuer and required to act as an independent fiduciary agent taking certain responsibilities. This includes, for example, ensuring proper registration of cover assets, verifying valuations in line with technical standards and ensuring compliance with coverage and OC requirements. Rules regarding the management of the cover pool may also include the treatment of non-eligible assets, the mode of removal of (non-performing or ineligible) assets from the pool and provisions for the use of derivatives and hedge and their treatment in the case of default. Such provisions may explicitly differentiate between the management of the cover pool while a going-concern and after default.

Overcollateralization and Liquidity Requirements

We analyze legal OC and liquidity requirements with a view on their ability to mitigate credit and liquidity risks effectively. In order to mitigate credit risk, covered bond frameworks usually foresee detailed requirements in respect of amount and type of overcollateralization (OC) and the frequency and type of cover test applied (nominal, net present value). At times, the issuer may be allowed to commit OC in excess of the legally required minimum and covered bond holders may be given priority to excessive OC, which then need not be returned to the insolvency estate of the issuer upon default.

Provisions for the management and mitigation of liquidity- and refinancing risk regularly stipulate mechanisms such as matching, stress testing, the provision of liquidity reserves or soft bullet / pass through structures (also see “Liquidity and Refinancing Risk” below). These cannot, under all circumstances, ensure the timely payment of the program´s obligations, which is why covered programs typically also feature structural safeguards such as credit lines and other facilities.

External Support

To complement the legal framework analysis, Creditreform Rating assesses the potential for receiving external support following a default of the issuer, in which case the program would have to turn to other sources to meet its obligations and mitigate refinancing risk. Generally, we expect external support for a program to increase with moderate to high systemic relevance, i.e. if the costs of a program´s failure to the economy and the financial system would outweigh the cost of providing support.

The systemic relevance of a covered bond market will be sized relative to the economy, and we also take into account the specific program size. External stakeholder support may be provided by governments and central banks or through other private sector support mechanisms (i.e. secondary market liquidity). CRA assesses the likelihood of external liquidity injection and support for troubled issuers to service their covered bonds while a going-concern, as well as liquidity support to the program after the default of an issuer.

3.3.2 Transaction Structure

In the case of non-regulated covered bonds, contractual features are often designed to achieve similar enhancements as provided by the prevalent legal frameworks. These may include mandatory OC, eligibility criteria, cover pool management provisions (monitor and trustee, removal of delinquent assets, derivatives, coverage tests etc.), maturity extensions and reserves, as well as LTV and valuation requirements. Creditreform Rating will assess individual program features both in absolute terms and benchmarked against comparable peer-group programs when appropriate to judge their appropriateness in mitigating credit- and refinancing risk and providing a contractual framework that effectively protects bondholders and ensures a high credit quality of the covered bonds.

3.4 Liquidity- and Refinancing Risk

In the case of an issuer default, and following the switch to the second recourse, liquidity- and refinancing risk poses a threat to the stability of the covered bond program. In particular, while the issuer is still a going-concern, liquidity- and refinancing requirements will normally be addressed by the issuer in tapping its own funding sources to address:

- the refinancing of larger funding gaps resulting from asset-liability mismatches, and
- short-term liquidity needs, i.e. the ongoing coverage of interest and senior costs

In our analysis of liquidity- and refinancing risk, we assess the extent to which the legal- and regulatory framework, the particular transaction structure and our assessment of external support, in conjunction with the current cover pool profile, facilitate the timely payment of interest and principal in a scenario where the issuer is assumed to be in default. The result determines the

primary uplift on the covered bond rating from the rating floor and influences the extent and amount of refinancing- and liquidity risk we incorporate in the quantitative modelling stage.

3.4.1 Short-Term Liquidity Coverage

The coverage of liquidity needs to avoid payment interruptions is often addressed structurally, through reserves, credit lines and external support or other mechanisms stipulated by the legal and regulatory framework. Covered bond programs often benefit from a mandatory liquidity reserve to cover a number of months of liquidity, which may also include the coverage of principal payments and usually need to be tested regularly ("pre-maturity test"). Where the legislative framework does not require coverage, issuer may decide contractually or *via* a public statement to maintain the same, in which case we base our assessment on a suitable track record presenting a credible history of commitment to the contractual obligations. Absent these mechanisms, we consider increased short term liquidity risks which may lead to a lower primary rating uplift.

3.4.2 Asset-Liability Mismatches

Assets of the cover pool often amortize over a time horizon that is beyond the scheduled maturity of the covered bonds, resulting in asset-liability mismatches (ALM). After the default of the issuer, ALM risks pose a major threat to the timely payment of principal. Creditreform Rating analyses the interplay of legal and regulatory provisions and specific structural features of the covered bond program to understand the effective nature of the ALM, which may change upon the failure of the issuer (i.e. due to conditional acceleration of the covered bonds, soft-bullet or pass-through structures etc.). If protective mechanisms are inefficient in mitigating ALM risks completely, the covered bond program (*via* its trustee) will have to temporarily access the capital markets on its own to obtain external funding or liquidate cover assets to successfully address ALM funding gaps.

Pre-Maturity Tests and Matching

Issuers may be required to prefund the covered bond principal redemptions coming due in a given period ("pre-maturity test"), for example 180 days or 12 months. Such coverage tests will have to be performed in regular intervals; Issuers are normally required to buffer potential shortfalls with sufficiently liquid assets.

Required matching mechanisms often stipulate the coverage of the covered bonds nominal and/or net-present-value and excess overcollateralization, including the mode and frequency of coverage testing. We do not consider natural matching to be fully efficient in mitigating ALM risks unless the mechanisms require an effective matching of cash flows, which is not the case in all covered bond jurisdictions.

Repayment Method

Covered bonds typically amortize in bullet-like structures. However, the method of repayment may differ among covered bond programs and the legal provisions guiding their issuance.

a) With a hard-bullet structure, any cash flow requirement that is not met at the maturity date will trigger an immediate default of the notes, posing the highest risk of loss to the investors if the issuer is not a going-concern. The cover pool in hard-bullet structures will typically consist of a higher share of liquid assets, also implying higher costs of carry to the issuer.

b) Soft-bullet structures allow for an extension period (i.e. 12. months) from the maturity date and prolong the final maturity in order to allow the manager of the covered bond program (i.e. the trustee in the case of an issuer default) to collect further installments and manage more efficiently the sale of cover assets, thereby reducing the risk of inefficient monetization and “fire-sale”, and thus of losses to the investors.

c) Conditional pass through (CPT) structures are designed such that, if the notes cannot be serviced and repaid as of the predefined schedule, then the final maturity date will be determined by the longest-lived assets of the cover pool, including potential work-outs. Investors will be allocated pro-rata the available proceeds from the cover assets. In our opinion, CPT structures can efficiently mitigate refinancing risk, as the possibility of an event of default due to asset-liability mismatches and a failure of principal repayment is completely eliminated. However, we note that CPT structures introduce “extension risk” to investors.

Covered bond programs may also be designed or legally required to accelerate the repayment of covered bond principal conditional on an issuer default or an extension of the program. In this case, the amortization of the covered bonds will begin immediately using available liquidity according to a pre-defined waterfall.

Asset Sales and Refinancing Costs

We consider the sale of cover assets the issuer´s primary route to addressing unmitigated refinancing risks and assume a fire-sale discount on the nominal value which we size depending on our assessment of the relevant market(s). In the case of a sale of cover pool assets to meet financial obligations, the cover pool administrator will need to find a buyer or sell in the secondary market part of the cover pool assets to overcome temporary refinancing requirements. We typically assume that a sale of assets will occur at a discount to the nominal value and size such discount on the basis of observable (historical) market value spreads, i.e. secondary market RMBS, CB secondary market spreads and spreads on comparable and relevant securities and other indicative sale prices of similar assets, if available, stressed to the tested rating-level and including reasonable cost assumptions.

3.4.3 Other Liquidity Risks

A number of additional events may pose a threat to liquidity and will be assessed by Creditreform Rating during the rating process. These may include, for example, payment interruptions following an issuer default while the special administrator takes over the management of the pool; uncertainty with respect to the effectiveness of legal provisions to protect liquidity if these have not been tested in court; and counterparty risks such as the default or termination of swaps (also see “Counterparty Risk”).

3.5 Credit- and Portfolio Risk

3.5.1 Cover Pool Asset Analysis

We elicit the credit risk profile of the cover pool to understand the performance of the cover pool assets in full detail. This typically entails the calculation of the expected loss of the portfolio over its life by combining asset-specific loss- and recovery assumptions and their timing. Thus, we seek to understand the collateral characteristics that shape the magnitude and pattern of defaults and loss severities. A number of quantitative parameters of portfolio are derived from data, such as its asset-liability profile, its granularity, levels of prepayments, credit enhancements such as LTVs/LTRs and available OC, exposure to interest and FX risk, delinquency rates, seasoning and remaining terms, type and amount of substitute and foreign assets, servicer and other third-party costs, etc. Creditreform Rating will use all information available (including monitoring reports, if available) and may make reasonable assumptions based on further quantitative research in particular instances where information is (partly) unavailable. The results – rating-specific assumptions about defaults, recoveries and corresponding expected losses – then serve as input to our cash flow model, in which we test rating-specific loss assumptions and stress scenarios.

Cover pool assets generally comprise mortgage (residential and/or commercial) loans or public-sector assets. Section 3.5.4 details the specific modeling approaches which apply in the context of the rating of covered bond programs.

3.5.2 OC and Credit Enhancements

The level of available overcollateralization (OC) is an important mechanism supporting the secondary rating uplift. As it may vary with the amount of covered bonds issued or amortized and assets being added or removed, it is typically actively managed by the issuer to support and maintain a high level of credit support. While the issuer is obliged only to provide a level of OC that satisfies regulatory tests and maintains the minimum legal or contractual level of OC, issuers often commit to a higher level of OC to further mitigate credit risk and support higher ratings. Creditreform Rating may take into account such voluntary excess OC if the legal analysis indicates that it will be available to covered bond holders in the event of a default and switch to the second recourse. In general, the likelihood that a certain level of OC will be stable or decrease over time depends on the nature of the commitment and how (legally) binding it is.

We typically observe the historical volatility of available OC, assuming that issuers with a regular issuance practice and high-level issuer ratings have a strong incentive to maintain stable and predictable OC management policies. On the other hand, issuers with low or deteriorating issuer ratings may choose to prioritize the maintenance of legal minimum OC requirements over additional commitments and rating support, exercising their management discretion, if any, to target a lower of OC and remain eligible for access to central-bank funding if capital market funding is no longer economically feasible.

While we take into account the current level of available OC for investment-grade issuers, we may decide to apply forward looking downward adjustments to OC levels for non-investment grade issuers and issuers with a negative outlook where we expect a change of OC management policy, and refer to the legal minimum OC absent any binding contractual agreements.

Creditreform Rating will factor in additional credit enhancement mechanisms pertaining to a particular covered bond program in the determination of credit- and portfolio risk, such as credit facilities, insurances or hedging instruments, or guarantees.

3.5.3 Interest- and FX Risk

The cash flows available to covered bonds may be sensitive to movements in interest rates or foreign exchange quotes. Interest-rate and currency mismatches typically arise when cover pool assets and covered bonds have different interest rates, durations, or currency denominations. FX risks emerge with currency mismatches between covered bond assets and liabilities and may lead to a reduction of available cash flows. Movements on interest rates can pose a risk when significant differences between assets and covered bonds exist, either because of a fixed vs. floating mismatch or because of duration gaps between assets and liabilities. Depending on the particular conditions, interest rate risks will materialize in rising or falling interest rate environments.

Creditreform Rating, using deterministic and/or stochastic approaches, will assess risks by stressing the interest rate term structure using and taking FX volatility into account. The starting point of the analysis might be the historical evolution of forward rate curves and historical exchange quotes in the pertinent market. Creditreform Rating will assess stress scenarios by taking into consideration particular parameters (e.g. specific curve tenors, or FX volatility) and will base its analysis on prudent assumptions concerning stressed movements in interest and FX rates to incorporate the results in its cash flow model. The FX and interest rate risk breakdown serves to enhance the cash flow model by providing a consistent analysis to appraise economic stress events.

3.5.4 Modelling Approach and Assumptions

The aim of credit- and portfolio risk analysis is to derive rating-level specific loss assumptions which can be factored into the cash flow model. Typically, the expected loss (EL), a key target

parameter to be used in the cash flow model, is derived in a particular rating-scenario S using the formula EL_s = default $rate_s$ x (1 - recovery-$rate_s$). The scenario-specific default and recovery rates are computed by applying stress multiples or haircuts which depend on the assumed distribution of the underlying variable. Depending on the type of asset and pool parameters, Creditreform Rating will apply different modeling techniques to derive the necessary inputs.

Mortgage Collateral

In the case of cover pools backed by mortgage collateral, Creditreform Rating uses relevant historical information (aggregated or at loan-level, macroeconomic- and issuer-specific performance data) to characterize the cover pool (i.e. geographic distribution, delinquencies, arrears, seasoning, LTVs, NPL shares etc.) and elicit the pool´s credit risk profile. The results define base-case default and recovery assumptions which are used to size rating-level specific stress scenarios.

One typical characteristic of real estate portfolios is a relatively high degree of granularity. Creditreform Rating will typically estimate credit risk present in granular cover pools using the Large Homogeneous Portfolio ("LHP") approach to derive the default distribution of the portfolio at the relevant time horizon. Under the LHP assumption, there are two relevant input parameters to estimate the default distribution: (1) mean asset probability of default and (2) asset default correlations at the relevant time horizon. Creditreform Rating will evaluate a portfolio´s loan-borrower- and property specific information to adjust and differentiate base-case assumptions derived from issuer-specific performance data, macroeconomic and market data, if available. Creditreform Rating may apply conservative adjustments to base-case assumptions for cover pools with a low degree of homogeneity (high dispersion of borrower credit quality).

To determine the recovery rate assumption in mortgage pools, Creditreform Rating will consider available market information and take into account transaction-specific information, such as LTVs and property-related data, as well as issuer- and market related recovery performance data. We typically fit statistical distributions (such as beta) to model recoveries and corresponding loss-given default rates. Sufficient recovery information to calibrate such distribution should be provided by the issuer, i.e. our assumptions typically reflect issuer-specific data. In the absence of further differentiating data, Creditreform Rating will make use of public information, i.e. historical development of the real estate market and mortgage price indices, other macroeconomic data and market studies to derive country-specific base-case assumptions and reasonable recovery stresses, including assumptions about foreclosure and asset-sale costs.

Sovereign Credit Collateral

Sovereign cover pools are generally less granular than real estate portfolios. Importantly, the amount of creditors in the portfolio is typically very limited. Under such conditions, the assumption of a complete diversification of idiosyncratic risk does not hold and the LHP approach is not

suitable to assess the cover pool credit risk. Creditreform Rating will appraise risks in non-granular portfolios by means of market-standard factor models in a Monte-Carlo (MC) simulation framework. In this framework, multiple risk factors and different dependency structures can be evaluated. By definition factor models sketch the relationship between different events, for example, state of the economy and the occurrence of defaults in a credit portfolio.

The base-case default assumption for sovereign credits will be derived from the respective Creditreform Rating sovereign rating. For cover pools including sub-sovereign credits, we typically consider the ultimate obligor credit rating – i.e. the sovereign rating – as relevant unless current information indicates that credits at the federal and/or municipal level will not receive ultimate obligor support. In this case, we may apply a qualitative down-notching to sub-sovereigns which will be sized taking into account all relevant aspects. In the MC simulation framework, we generally consider sovereign credit ratings to equal corporate issuer ratings with respect to probabilities of default, which we consider a conservative approach. In deriving base-case assumptions, Creditreform Rating will rely on information provided by the issuer. If such information is not available or does not fulfill minimum transparency standards, Creditreform Rating will make use of available public information.

Generally, Creditreform will fix recovery rate assumptions across all government obligations depending on a particular rating scenario based on historical data and empirical research. The following table shows our indicative recovery assumptions for broad rating-category stress levels:

Table 1: Recovery Rate Assumptions for Sovereign Credit | Source: CRA

AAA	AA	A	BBB	BB	B	CCC	CC	C
25%	30%	35%	40%	45%	50%	50%	50%	50%

In Creditreform Rating´s opinion, the sovereign rating serves as a cap for debt from other (sub-) governmental institutions. We assume that the occurrence of a sovereign default event triggers a default at sub-sovereign level as well. Once the default parameters have been defined, Creditreform Rating will examine occurrence of defaults over time in the portfolio and derive the corresponding default and loss distribution of the portfolio as an input to the cash flow model.

3.6 Cash Flow Model

The Creditreform Rating cash flow analysis is designed to determine whether the cash flows from the cover pool assets are sufficient to pay interest and principal to the covered bond holders in a complete and timely fashion once recourse to the cover assets has been enforced and the issuer, no longer a going-concern, ceases to provide liquidity to the program. We typically assume an immediate default of the issuer at the cut-off date and do not take into account any future issuance of covered bonds.

The model considers the covered bond asset-liability structure, i.e. cash flows from cover pool assets versus outstanding payments on covered bonds, as well as available OC, liquidity reserves, derivatives and other credit enhancements. We apply the rating-level specific stresses and expected loss from credit risk analysis in order to derive stressed cash flows commensurate with the rating level representing the feasible secondary uplift up to the maximum secondary uplift of three notches. We then test whether the cover pool, including available credit enhancements, would be sufficient to service all covered bonds in the given scenario to determine the maximum available secondary uplift.

Our model will include liquidity support mechanisms such as reserves which may be used to bridge short term funding requirements of the covered bond program. If credit lines exist which the covered bond program might tap, our counterparty risk assessment will determine the risk associated with a (non) availability of such resources (see “3.8 Counterparty Risk”).

3.7 Sensitivity Analysis

Information gained in the course of the rating process is used to conduct sensitivity analyses with respect to key parameters of the cash flow model. This enables scenario-based stress tests by which the cash flow model, in the context of a particular rating scenario, is subjected to predetermined additional stress whose effect upon the serviceability of the structure is examined. Sensitivity analyses are used to study the extent to which the stability of the structure is subject to change due to variations in input parameters. This enables an assessment of the effects of uncertainty and risk related to the input parameters and the resulting changes in the rating indications of the issue. In addition to the stress factors affecting the rating relevant loss rate, the following parameters can be examined with respect to their influence on the serviceability and ultimate repayment of the covered bond tranches:

- Level of default and recovery rates, loss rates
- Level and timing of prepayments
- Timing of defaults and recoveries
- Interest rates and FX quotes
- Portfolio yield (excess spread)

In order to determine a rating indication for a tranche, the predefined scenarios are evaluated. Creditreform Rating checks whether the claims of creditors to payment of interest and principal can be fulfilled in accordance with contractual obligations.

3.8 Counterparty Risk

The analysis of counterparty risks focuses on key transaction parties involved and an assessment of their capabilities in managing a covered bond program according to the terms and conditions of their mandate. Counterparty risks reflect the financial strength and professional experience of

parties vital to the performance of the reviewed transaction. CRA assesses to what extent counterparty risks could affect the issue´s future performance. For example, risks might arise through the provision of derivatives, credit lines and financial guarantees.

CRA therefore assesses the creditworthiness and experience of the swap counterparties, guarantors, collateral providers, account-banks and trustees. CRA examines all dependencies with regard to such parties involved. The solvency and credit quality of parties involved in the transaction are therefore reviewed in the context of the rating process and will be appropriately factored into the rating.

4 Monitoring and Surveillance

The rating is valid for the length of the monitoring period. During this period, the development of the issue is continuously monitored by the team of analysts to ensure at all times the validity of the rating indication provided. For this purpose, the analysts remain in direct contact with the relevant parties to the transaction while evaluating relevant information. Should any significant events occur during surveillance which have a negative or positive effect on the quality of the issue, the rating will be adjusted.

At the end of the twelve-month period (monitoring phase), it is generally necessary to carry out the rating again in the context of a follow-up rating.