

Collateral Haircut Calculation Approaches

Discussion Paper

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Executive Summary

This discussion paper examines the practical challenges of calculating collateral haircuts under the CRR3 framework and the corresponding PRA framework. We demonstrate that the haircut concept is not straightforward in practice, particularly where the regulatory language appears to assume that collateral is repossessed and sold.

The analysis is relevant for both Foundation IRB (F-IRB) and Advanced IRB (A-IRB) approaches, although the regulatory mechanics differ. The term “haircut” appears in CRR3 and the UK prudential framework, however neither prescribes a regulatory definition.

Using a stylized aircraft finance example, the paper shows how different workout scenarios and reference values can result in materially different haircuts for the same collateral. Although the example is aircraft-specific, the underlying issue is relevant more broadly to asset-based specialized lending, where collateral value is central to recovery, but the asset is not always sold. Additionally, we use observed LGD data collected by Global Credit Data (GCD) to illustrate the frequency of different workout scenarios.

The central message is that collateral haircut measurement is sensitive to the availability of observable realization data and the selected reference value. A framework focused primarily on repossessed collateral and forced-sale proceeds may not capture the full range of workout scenarios observed in specialized lending and may therefore be insufficiently risk-sensitive.

The implications are not limited to haircut measurement. Haircuts also affect LGD outcomes, although in different ways under F-IRB and A-IRB. Under F-IRB, the haircut contributes to the calculation of regulatory LGD through the recognition of collateral. Under A-IRB, it contributes to the LGD input floor against which the bank’s internal LGD estimate is tested.

This paper therefore aims to contribute to the discussion by illustrating these practical challenges and their implications for specialized lending portfolios.

1. Purpose and Scope

This paper examines the practical challenges of measuring collateral haircuts for specialized lending exposures and explains why these challenges matter for LGD calculation. We aim to provide an analytical basis for discussion by showing how haircut outcomes can differ depending on the reference value used and the availability of realized proceeds, and why the interpretation of those outcomes matters for LGD under F-IRB and A-IRB approaches.

The starting point is that a collateral haircut is not only a valuation comparison. In the regulatory context considered in this paper, it can affect recognized collateral value, the secured and unsecured portions of an exposure, and therefore the LGD outcome or LGD input floor.

The paper focuses on two related measurement questions. The first is the choice of the reference value, meaning the collateral value against which realised proceeds are compared. The second is the observability of realized proceeds and how this is affected by workout scenarios. The scenarios considered are restructuring, loan sale, consensual collateral sale and enforcement-led collateral sale.

We use a stylized aircraft finance example, supported by observed GCD aircraft finance workout data. Aircraft finance is used because collateral value is central to recovery and because

market value information is commonly available. The example is aircraft-specific, but the underlying principles are relevant more broadly to asset-based specialized lending exposures.

2. Regulatory Treatment of Haircuts in LGD Calculations

CRR3 references collateral valuation adjustments and realized proceeds in several provisions, including Article 199(6)(d) and Article 230 for F-IRB and Articles 161 and 495b for A-IRB as well as EBA Guidelines (EBA/GL/2017/16, paragraph 117). PRA expectations are described in SS4/24, paragraph 12.21. However, regulatory guidance on haircuts remains limited and does not provide a definition of the term. This analysis is particularly relevant in view of the forthcoming European Banking Authority report on the appropriate calibration of risk parameters, including the haircut parameter, mandated by Article 495b of the CRR.

EBA and PRA state in their guidelines that banks should assess “whether the value of repossession adequately reflects the value of the repossessed collateral”, consistently with internal requirements for collateral management, legal certainty and risk management. Regulatory texts also instruct banks to apply an “appropriate haircut to the value of repossession” and include the post-haircut value as a recovery in the calculation of economic loss.

The same haircuts are used in different regulatory contexts. In both F-IRB and A-IRB, the haircut reduces the recognized value of collateral. This reduces the secured portion of the exposure and increases the unsecured portion, where a higher LGD is applied.

Under F-IRB, the haircut forms part of the prescribed LGD calculation. It affects the recognized collateral value, the split between secured and unsecured exposure, and therefore the final regulatory LGD that the bank must apply. Aircraft collateral type falls within the residual category of “other physical collateral,” which is subject to a 40% haircut. The regulatory text does not explain the empirical basis for this percentage.

Also for F-IRB, banks need to consider the eligibility requirements for other physical collateral under Article 199(6)(d). In particular, banks must be able to demonstrate that, in at least 90% of liquidations, realized proceeds from the collateral are not below 70% of the collateral value. This makes the availability and interpretation of realized proceeds relevant not only for haircut measurement, but also for collateral recognition.

Under A-IRB, the same haircut serves a different function. It is used to calculate an LGD input floor, rather than replacing the institution’s own LGD estimate. The purpose of the input floor is to prevent internally modelled LGDs from falling below a regulatory minimum.

Both the EU and UK frameworks indicate that the haircut should reflect the expected price achieved from the sale of repossessed collateral, considering factors affecting estimated recoveries, including changes in collateral value, discounting, direct costs and market liquidity. The comparative haircut analysis in this paper focuses on the collateral value component. Discounting, direct costs and market liquidity remain relevant to economic loss and LGD calculations but are outside the scope of the comparative haircut.

3. GCD Data and Illustrative Loan Example

3.1 GCD's Empirical Aircraft Finance LGD Data

GCD maintains one of the largest bank-owned credit risk data consortia globally, with contributions from 50+ member banks across Europe, North America, Asia-Pacific, Africa and the Middle East. GCD pools granular, bank-internal data covering Probability of Default (PD), Loss Given Default (LGD), Exposure at Default (EAD), rating migrations, defaults, recoveries and named-counterparty benchmarking. The consortium has more than 20 years of history and provides coverage across a broad range of non-retail asset classes.

For the purpose of this paper, we use GCD's specialized lending LGD Data Pool covering more than 500 defaulted aircraft finance facilities from EU banks over the period 2000–2025.

3.2 Illustrative Loan Example

The example is based on a stylized defaulted loan created for discussion purposes by the Global Credit Data community. It is designed to be realistic, while avoiding the disclosure of confidential obligor-level information. Key characteristics of the facility are shown in Table 1.

Although aircraft finance portfolios are more commonly secured by narrow-body aircraft, a wide-body example is appropriate for this analysis because the core financing structure, workout considerations and market price discovery process follow the same principles. Therefore, both aircraft types can serve as a representative illustration of a typical default workout process.

The example uses observed data up to the point of default and then branches into four illustrative scenarios, reflecting plausible collateral valuation movements and workout scenarios developed with input from the GCD community.

Category	Item	Value
Loan purpose and structure	Purpose / asset	Financing of a new Airbus A350-900
	Year built / loan agreement	May 2016
	Original maturity	12 years
Origination metrics	Initial loan amount	115 million USD
	Collateral market value at origination	144 million USD
	Loan-to-value at origination	80%
Default and resolution	Default date	May 2020
	Exposure at default	76.7 million USD
	Resolution date	Scenario-specific

Table 1. Key characteristics of the illustrative specialized lending exposure

The example is presented in the Excel workbook accompanying this paper. The file provides the detailed calculations underlying the example described above. It shows the evolution of collateral values, loan balances, collateral coverage metrics, LGD calculations and recoveries at each stage of the workout process.

The workbook is organized into separate worksheets for each workout scenario. Readers can follow the calculations from top to bottom within each worksheet, with inputs, intermediate calculations and outputs presented in sequence. A field description tab is included to explain all variables and calculation parameters used throughout the workbook.

The evolution of collateral values is an important aspect of the analysis shown in the workbook, especially from the perspective of assessing inferred sale proceeds. In aircraft finance, market values are typically informed by periodic valuations from ISTAT- or ASA-certified appraisers. These valuations are usually produced for a specific aircraft type and year of construction and are generally conducted on a desktop basis rather than through full physical inspections. Banks commonly obtain them annually or semi-annually.

4. Workout Scenarios and Haircut Approaches

4.1 Workout Scenarios

Following a default, a case may be resolved through several different workout scenarios. This paper considers four common ones: restructuring, loan sale, consensual collateral sale, and a collateral sale following enforcement. The workout scenario matters because it determines whether collateral sale proceeds are directly observable, need to be inferred, or are not available at all. Table 2 describes each scenario in detail.

Scenario	Description	Relevance to haircut calculation
Restructuring	The borrower defaults but negotiates amended terms with the lender and resumes payments under a revised repayment schedule. The aircraft's residual life—typically around 25 years—may allow the lender to extend the maturity and potentially avoid a loss.	No collateral sale proceeds can be observed. Haircut measurement may therefore rely on updated collateral valuations rather than realized sale proceeds.
Loan sale	The lender sells the non-performing loan to a third party.	The observed proceeds reflect the sale of the loan rather than the sale of the collateral. No collateral sale proceeds can be observed. Haircut measurement may therefore rely on updated collateral valuations rather than realized sale proceeds.
Consensual collateral sale	The borrower sells the collateral with lender consent and applies proceeds to the outstanding exposure.	If sale proceeds are below the outstanding exposure, the lender is likely to observe the sale price because the proceeds directly affect the recovery shortfall. If the proceeds exceed the outstanding exposure, the lender may be repaid in full without observing the total collateral-sale proceeds. This, in turn, would artificially increase calculated haircut due to lack of information.
Enforcement-led collateral sale	The lender takes control of the collateral and executes a direct asset sale.	Sale proceeds are directly observable.

Table 2. Workout scenarios considered in the haircut comparison

4.2 Empirical Aircraft Finance Default Workout Scenarios

GCD's aircraft finance dataset shows that enforcement-led collateral sales account for only 10% of default resolutions. It is therefore important to consider a broader range of workout scenarios when assessing haircut approaches. Of the remaining resolutions, 23% return to performing status, 2% result in a loan sale and 65% involve other restructuring or resolution scenarios. Limiting the analysis to collateral-sale cases would reduce the representativeness of the sample and risk overstating the relevance of forced-sale outcomes. This is particularly important given the regulatory texts' focus on repossession.

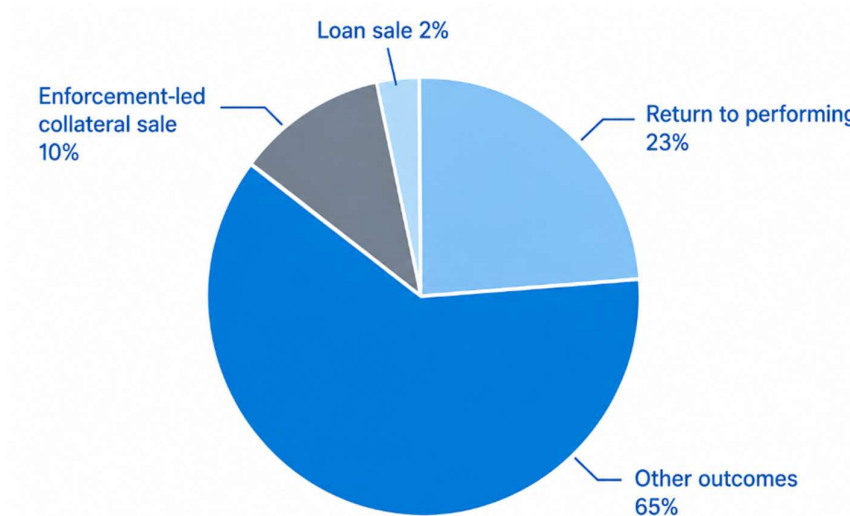


Chart 1. Aircraft Finance default resolutions by workout scenario

4.3 Haircut Definition and Calculation Approaches

This section defines the haircut approaches used in this paper and explains how different workout scenarios coupled with the choice of reference point affect the empirical calculation of those haircuts.

A collateral haircut is defined in this paper as the percentage reduction from a selected collateral reference value to a realized value. The general formula is as follows:

$$\text{Haircut} = \frac{\text{Value at Reference Point} - \text{Value Realized}}{\text{Value at Reference Point}}$$

Ideally, the realized value is represented by the observed sale proceeds when the collateral is sold. However, if the collateral is not sold, sale proceeds cannot be observed. In such cases, a proxy—such as an estimated market value close to the resolution date, referred to in this paper as inferred sale proceeds—can be used.

In an enforcement-led collateral sale, the realized value is usually directly observable. Other workout scenarios are less straightforward: the collateral may not be sold, or the sale may take place through an orderly borrower-led process. Inferred sale proceeds allow the haircut approaches described below to be applied to these common scenarios, even where realized collateral sale proceeds are not directly observable.

Furthermore, the value at the reference point can be chosen at different points in time. The choice of point in time determines the interpretation of the haircut.

The regulatory texts do not explicitly prescribe the reference point in time against which sale proceeds should be compared. They do not specify whether the relevant benchmark should be the collateral value at origination, before default, at the time of sale or at another point in time. This distinction matters because each reference point captures a different component of value

decline and therefore produces a different interpretation of the resulting haircut as shown in Table 3.

Approach	Formula	Interpretation
Origination-to-sale	$H_{OTS} = \frac{V_O - V_S}{V_O}$	Compares realized sale proceeds with the collateral value recorded at origination. It is useful for understanding full-cycle value deterioration but should not be interpreted solely as a workout discount.
One-year-prior-to-default-to-sale	$H_{1Y} = \frac{V_{1YP} - V_S}{V_{1YP}}$	Measures the reduction from the valuation reported one year prior to default or a valuation closest to one year prior to default with a maximum of two years prior to default compared to the realized sale proceeds.
Market-value-at-sale-to-sale	$H_{MVS} = \frac{V_{MVS} - V_S}{V_{MVS}}$	Measures the discount from contemporaneous market value to realized sale proceeds and is therefore most directly linked to execution discount or forced-sale impact.

All variables used in all formulas presented in this paper are defined in Appendix 1.

Table 3. Summary of haircut approaches

The formulas presented in Table 3 exclude sale-related costs and discounting. This is a deliberate simplification for the purpose of comparing haircut definitions. It allows the analysis to focus on the relationship between the selected collateral reference value and the observed or inferred sale proceeds. Costs and discounting are economically relevant and should be considered in the LGD and the economic loss calculations. However, including them directly in the haircut calculation may change the meaning of the haircut. In particular, discounting collateral sale proceeds back to the default date could result in the time value of money being reflected both in the haircut and in the LGD calculation.

Several methodological considerations of haircut calculations are reviewed in detail in Appendix 2.

Each haircut approach answers a different risk management question. Some approaches are easier to operationalize because the relevant valuations are already captured in lending or workout systems, while others provide a cleaner economic read on sale-related costs but require more timely and reliable market value data.

Approach	Advantages	Disadvantages
Origination-to-sale	Simple to calculate and usually supported by readily available origination valuations. High data certainty given observed values.	Origination may be many years before sale, so the result can capture ordinary ageing, market cycles and time effects rather than collateral quality or workout execution discount. The resulting haircut may not be comparable across facilities because

Approach	Advantages	Disadvantages
		the time between origination and realization can vary significantly.
One-year-prior-to-default-to-sale	Better aligned with pre-default risk monitoring than origination value. It also reduces the impact of long seasoning. Other recovery drivers, such as time to sale and discount rate, can be estimated separately rather than embedded in the haircut.	Requires reliable periodic collateral valuations. If valuations are stale, or model-based, the haircut may mix market deterioration and valuation policy. The period between default and sale may vary materially across cases, causing collateral depreciation during the workout period to become a dominant driver of the measured haircut.
Market-value-at-sale-to-sale	Most directly linked to execution discount, forced-sale impact and liquidity at resolution. The cleanest measure for separating collateral market value from sale realization. Helps isolate execution discount from broader changes in collateral market value.	Operationally demanding because it requires a credible market value at or near the sale date, which may not be available for all workout scenarios.

Table 4. Pros and cons of haircut calculation approaches

4.4 Comparative Haircut Results by Scenario

Table 5 summarizes the haircut results by approach and workout scenario based on example described in chapter 3.2. The underlying scenario-level calculations, including the assumptions applied, are provided in the accompanying Excel workbook.

Haircut approach	Restructuring	Loan sale	Consensual collateral sale	Enforcement-led collateral sale
Origination-to-sale	37%	34%	42%	46%
One-year-prior-to-default-to-sale	30%	26%	35%	40%
Market-value-at-sale-to-sale	N/A	N/A	6%	15%

Table 5. Haircut results by approach and workout scenario

The results illustrate that the same exposure can produce materially different haircut values depending on the selected reference point. The origination-based and pre-default approaches produce higher haircuts because they capture a broader period of collateral value deterioration. Whether the same pattern holds for other specialized lending asset classes depends on their value dynamics; real estate finance, for example, is outside the scope of this paper. The market-

value-at-sale approach produces lower haircuts because it focuses more narrowly on the difference between contemporaneous market value and sale proceeds.

In the restructuring and loan sale scenarios, collateral sale proceeds are not directly observable and are therefore inferred for the purposes of the comparison. In the consensual collateral sale and enforcement-led collateral sale scenarios, collateral sale proceeds are observed, subject to the information available to the lender.

Having compared the haircut approaches and workout scenarios, the next chapter considers how haircuts feed into LGD calculations. The link is direct: the haircut affects the recognized collateral value and therefore the secured and unsecured portions of the exposure.

5. LGD Implications of the Illustrative Example

5.1 F-IRB and A-IRB LGD Estimation

The haircut approaches discussed above are not only alternative measurement choices. They affect LGD calculations because the haircut determines the recognised value of collateral. The following section therefore explains how the haircut feeds into F-IRB and A-IRB LGDs. The haircut affects F-IRB and A-IRB through similar collateral-adjustments, but with different regulatory effects. In both cases, the haircut reduces the recognised value of the collateral. This reduces the secured portion of the exposure and increases the unsecured portion where a higher LGD is applied. The difference lies in how the resulting LGD is used. The simplified formula below shows the common structure; Appendix 1 defines the variables.

$$\text{Estimated LGD} = \text{LGD}_U * \frac{E_U}{E} + \text{LGD}_S * \frac{E_S}{E}$$

Under F-IRB, the prescribed calculation produces the LGD used for capital purposes. The 40% haircut, referred to in regulatory texts as the Volatility Adjustment for “Other Physical Collateral” applicable i.e. to aircraft assets, reduces recognized collateral value, shifts exposure from the secured to the unsecured portion and therefore increases regulatory LGD.

Under A-IRB, the bank uses its approved internal LGD estimate. However, the same collateral adjustment is used to calculate the LGD input floor. The 40% haircut reduces the recognised collateral value in the floor calculation and therefore increases the floor level. The haircut affects capital LGD only when the internal estimate would otherwise fall below the floor.

The same haircut can therefore have different regulatory effects depending on whether it is applied under F-IRB or A-IRB. This distinction is important when comparing regulatory LGD measures with realised LGD outcomes in the illustrative example.

5.2 Comparison of Regulatory LGD Estimates and Realised Outcomes

Realized LGD is separate from both regulatory treatments. It measures ex-post economic loss after recoveries, workout costs and discounting.

$$\text{Realized LGD} = 1 - \frac{\text{Discounted Recoveries}}{\text{EAD}}$$

Chart 2 compares the F-IRB regulatory LGD and A-IRB input floor calculated at origination with the realized LGDs across the four workout scenarios; all calculated based on the illustrative

example of defaulted Airbus A350-900. Detailed calculations are provided in the accompanying Excel workbook.

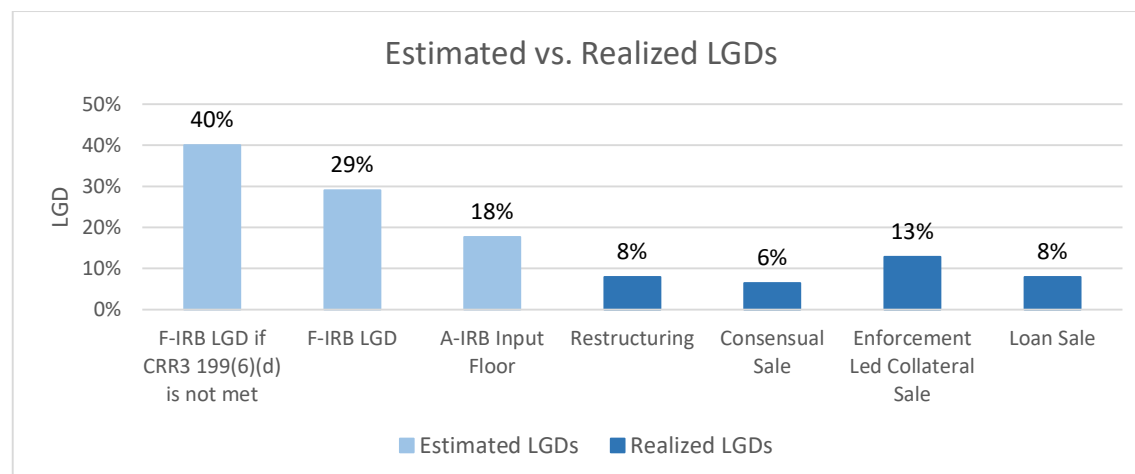


Chart 2. Comparison of F-IRB LGD, A-IRB Input Floor and Realized LGD

For F-IRB the regulatory LGD is 40% where collateral is not recognized under CRR Article 199(6)(d) and 29% where it is fully recognized. The key practical issue is whether recognition requirements are met, and whether realized proceeds can be evidenced across workout scenarios, including cases without lender-led repossession and sale.

Under A-IRB the LGD input floor is approximately 18%. This is not an LGD estimate: it is used only if the bank's internal estimate is lower.

Realized LGDs range from 6% for a consensual collateral sale to 13% for an enforcement-led sale; restructuring and loan sale both produce 8%. The variation reflects not only collateral value, but also workout scenario, recovery timing and discounting. In this example, the enforcement-led sale has the highest realized LGD because its longer resolution period increases the discounting effect. For broader aircraft finance recovery trends, see GCD's [2026 Recovery Rate Report](#).

The comparison shows why haircut value matters for LGD calculation. A higher haircut reduces recognised collateral value, increases the unsecured portion of the exposure and results in a higher F-IRB regulatory LGD or A-IRB LGD input floor, depending on the approach.

The comparison also raises a calibration question. If a haircut is used as an input to an expected-loss estimate, an average-based calibration may be appropriate. If the same haircut is used in the calculation of an LGD input floor, the interpretation may be different, because the floor is designed as a prudential minimum rather than as a central estimate. Its calibration could be aligned with that purpose, for example, by reference to an appropriate percentile of the haircut distribution rather than its average.

6. Conclusion

The comparison of haircut approaches shows that the collateral haircut calculation is not a technical detail. The resulting haircut depends on two main elements: the realized proceeds used and the reference value against which they are compared.

The first element, realized proceeds, may not always be observable. This is particularly relevant for specialized lending, where defaulted exposures are often resolved through restructuring or loan sale rather than collateral sale. If haircut analysis was limited to cases with directly observed collateral sale proceeds, only a small subset of workout outcomes could be used. In the GCD aircraft finance data used for this paper, enforcement-led collateral sales account for only 10% of default resolutions. For other workout scenarios, realized proceeds may need to be inferred, and the resulting measure should be interpreted accordingly.

The choice of the second element, reference value, matters. An origination-based measure may capture asset depreciation, ageing and market-cycle effects. A pre-default valuation measure may be closer to collateral monitoring practice but remains sensitive to valuation timing and time to resolution. A market-value-at-sale measure may be more closely linked to sale execution and liquidity but is only directly observable where a collateral sale has occurred or can be reliably approximated. The paper therefore does not identify a single preferred approach. Its purpose is to show how different definitions affect the resulting haircut and its interpretation.

These measurement choices related to haircut approach assumptions impact LGD outcomes. The 40% haircut for other physical collateral is used differently under F-IRB and A-IRB. Under F-IRB, the haircut contributes to the calculation of the regulatory LGD. Under A-IRB, it contributes to an LGD input floor, which is intended to establish a lower bound for internally estimated LGD. Its calibration could therefore be aligned with that purpose, for example, by reference to an appropriate percentile of the haircut distribution rather than its average.

For F-IRB, institutions also need to consider the eligibility requirements for other physical collateral set out in CRR3 Article 199(6)(d), including the requirement to demonstrate that realized proceeds are not below a defined share of collateral value in a sufficiently high proportion of liquidations. Where direct collateral sale observations are limited, this demonstration may be difficult and may depend on how non-sale workout outcomes are treated.

Ultimately, a meaningful collateral haircut depends on its reference point, the workout scenario and the nature of the available realization evidence. Bringing these elements together can provide a common basis for industry and regulators to reflect how haircut measures can reflect the full range of workout outcomes observed in practice and the distinct role of the haircut under F-IRB and A-IRB.

Appendix 1. Formula Definitions

Symbol	Definition	Measurement point / comment
H_{OTS}	Origination-to-sale haircut	Uses collateral value at origination as the reference value.
H_{1YP}	One-year-prior-to-default-to-sale haircut	Uses collateral value estimated by the bank reported one year prior to default or a value closest to one year prior to default with a maximum of two years prior to default. This is a conservative approach as the borrower still pays interest and principal during the year leading up to default.
H_{MVS}	Market-value-at-sale-to-sale haircut	Uses contemporaneous market value at or around sale date.
V_O	Collateral value at origination	Valuation used when the loan was originated.
V_{1YP}	Collateral value one year prior to default	Closest available valuation to one year before default; a maximum look-back rule can be applied.
V_{MVS}	Market value at sale	Estimated market value at the sale date or closest reliable observation.
V_S	Collateral sale proceeds	Gross proceeds from the sale or inferred value of the underlying collateral, before workout costs unless otherwise specified.
E	Total exposure value	Exposure used in LGD calculations.
E_U	Unsecured exposure amount	Portion of exposure not covered by recognized collateral.
E_S	Secured exposure amount	Portion of exposure covered by recognized collateral after applicable adjustments.
LGD_U	LGD applicable to unsecured portion	Parameter used for the unsecured portion of the exposure.
LGD_S	LGD applicable to secured portion	Parameter used for the secured portion of the exposure.

Appendix 2. Methodological Considerations

Valuation timing: Haircuts are highly sensitive to the selected valuation date. A valuation at origination, one year before default, at default or at sale each answers a different economic question. Discounting is not included in the presented haircut approaches because it is typically addressed separately in LGD and economic loss calculations.

Treatment of costs: Collateral sale proceeds should be defined consistently as gross or net of legal, enforcement, storage, maintenance and transaction costs. This paper presents haircut formulas excluding sale-related costs to focus on reference value methodological considerations.

Depreciation versus distress: For physical assets, especially aircraft, vessels, equipment and real estate, part of the reduction in value will reflect ordinary depreciation rather than credit distress or forced-sale discount. This is especially relevant for aircraft, where long contractual maturities and asset depreciation can materially affect collateral values independently of borrower distress.

Loan sale versus collateral sale: A loan sale discount is observable and practical, but it may include buyer return requirements, portfolio liquidity, uncertainty around enforcement and servicing costs. It should therefore be treated as a proxy rather than a pure collateral haircut.

Negative haircuts: Negative haircuts can arise where realizations exceed the selected reference value. A reporting approach should specify whether these are retained, floored at zero or disclosed separately.