

Observed Recovery Rates Dashboard Real Estate

Appendix: Database & Methodology



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1. About Global Credit Data

Global Credit Data (GCD) is a non-profit association owned by 50+ member banks with the simple mission to help banks better understand and measure their credit risks through data pooling and benchmarking activities. GCD's data pools support the key parameters of banks' credit risk modelling: Probability of Default (PD), Loss Given Default (LGD), Exposure at Default (EAD).

GCD started collecting historical loss data in 2004, offering exclusive access to its member banks. These banks receive the detailed anonymised database results and can therefore confirm results and test them on customised sub-sets of data. The LGD database now totals over 195,000 non-retail defaulted loan facilities from around the world to more than 100,000 borrowers covering 11 Basel asset classes.

In 2009, GCD introduced a PD database which now has over 15 years of default rates and PDs. GCD also runs a name and cluster benchmarking database to help banks calibrate and benchmark their PD, LGD and EAD models.

GCD operates all databases on a "give to get" basis, meaning that members must supply high-quality data to receive data in return. The robustness of GCD's data collection infrastructure helps place GCD's databases as the global standard for credit risk data pooling.

2. The GCD LGD/EAD Database

GCD has built up the world's largest non-retail bank loan loss database with almost 300,000 defaulted facility observations in all non-retail Basel asset classes. The Global Credit Data LGD/EAD platform, the largest of GCD's databases, was created in 2005 and has grown rapidly ever since. It now gathers detailed information on tens of thousands of defaulted counterparties, particularly data on cash flows and collateral. The driving principles and objectives of the Global Credit Data databases are:

- **Confidentiality**
GCD ensures data is fully anonymised
- **Comparability**
The data GCD utilises is only from banks with common definitions
- **Data Quality**
GCD ensures the highest standard of data quality through a rigorous process of validations, auditing and scoring
- **Granularity**
A full database is always returned to member banks, not just the aggregate
- **Reciprocity**
Member banks must contribute to the databases before they can benefit from them by asset class and year
- **Best practice sharing**
GCD utilises method workshops, surveys and HPE
- **Research standards**
There is always a common basis for shared analysis and research

The data collected by GCD comes from over 55 banks across the span of 20 years. Most defaults occurred from the year 2000 forwards. Global Credit Data returns the complete database of detailed transactions to member banks, excluding borrower names and Lender ID's. Members also receive some pre-calculated metrics (EAD,

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LGD, etc.) but are encouraged to calculate their own, using their own methods. Members are then free to sample the database, clean the data, calculate their own metrics and extract drivers.

Each member chooses the data pools (asset classes) to which it contributes. The most popular is the large corporate asset class, comprised of loans to corporates where the borrower group has a turnover of €50m or less. 55 banks in total have contributed to this asset class, largely driven by the fact that nearly all members have a large majority of their lending books by volume taken up by large corporate lending. Next most popular are Banks and Financial Companies, SME and Real Estate Finance, again driven by the ubiquity of these assets in loan books. More specialised financing such as Aircraft or Shipping Finance comprise a more limited club of around 20 or less lenders over time.

The purpose of the database is to develop banks' understanding of both the quality of their data in comparison to other banks and the risk involved in the loans. Global Credit Data member banks receive back a database of detailed transactions, excluding borrower names and Lender ID's. Due to the "give to get" rules applying, members only receive back data for the years of default and asset classes which they submitted. Members are then free to sample the database, clean the data, calculate their own metrics and extract drivers. When the data set is returned to member banks, each member can then slice and dice it to produce matching portfolios before finally creating a representative reference data set which is the key success factor when using pooled data.

3. Data definitions

REAL ESTATE

Corporates are defined as all facilities being either specialised lending Real Estate or having a real estate collateral attached.

DEFAULT

The Basel definition of default is used. According to the GCD Data Pool Regulations all Pool participants must report their resolved defaults. Reporting unresolved defaults is recommended but optional.

DEFAULT DATE

The date at which a borrower has been recorded as a default according to the Basel default definition.

HAIRCUT

Global Credit Data (GCD) members do not provide Haircut as an input field to the database but the underlying raw information of collateral values at different points in time before and after default. GCD calculates the haircut by using the following formula:

$$\mathbf{Haircut} = \frac{\mathit{Collateral\ Value}_2 - \mathit{Collateral\ Value}_1}{\mathit{Collateral\ Value}_1}$$

with

$\mathit{Collateral\ Value}_1$ Collateral Value reported one year prior to default. We choose the closed to one year prior to default with a maximum of two years prior to default

$\mathit{Collateral\ Value}_2$ Collateral Value reported after default for the sold collateral.

Haircuts are capped at 100%.

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LOAN TO VALUE (LTV)

Global Credit Data (GCD) members do not provide LTV as an input field to the database but the underlying raw information of collateral values and the lender outstanding amount at the time of default. GCD calculates the LTV by using the following formula:

$$LTV = \frac{\text{Lender Outstanding Amount}_3}{\text{Collateral Value}_3}$$

with

Collateral Value₃ Collateral Value reported at the moment of default

Lender Outstanding Amount₃ Lender Outstanding amount at the moment of default.

OBSERVED RECOVERY RATE

Global Credit Data (GCD) members do not provide Observed Recovery Rate as an input field to the database but the underlying raw information such as outstanding amount at default or cash flows during the default. GCD calculates Recovery Rate by following different methodologies. Internal methodology as well as regional regulatory requirements might result in different calculation methods which member banks are able to realise on the raw data they receive back. All variants follow the same basic definition

$$\text{Observed Recovery Rate} = \frac{\text{Recoveries}}{\text{Default Amount} + \text{Costs}}$$

For the calculation where nominal, undiscounted cashflows are used. Post default drawing are treated as part of the Default Amount. All Recovery Rates are floored at 0% and capped at 150%. The RRs are calculated on facility level.

A detailed composition of Recoveries and the default amount is given below.

Recoveries

Recoveries The following recoveries are collected separately:

- principal payments,
- interest payments,
- recorded book value in case the bank repossesses a collateral. It is the amount with which the credit obligation of the obligor has been diminished and which has been recorded as an asset on the balance sheet of the institution,
- fees and commissions received which are recoveries on extra fees and commissions charged to the obligor post default on additional services
- outstanding amount at resolution. The outstanding amount at resolution can only be greater than 0 in case the borrower returns to a non defaulted status. In this case it can be fairly assumed that the borrower will be able to pay back its obligation and therefore the amount is treated as if it were a recovery.

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Default Amount

=	Outstanding Amount at Default	The amount of the principal outstanding plus past due interest as at the default date.
+	Cash-out on Guarantee	Any cash drawing on a contingent facility. Contingent facilities have by definition an outstanding amount of 0 at default date. The cash-out converts them into a cash obligation on which the Recovery rate can be calculated.
+	Financial Claim	Financial Claims are the final adjustment of the exposure at default due by the obligor in default on a mark-to-market facility. It is the final claim, if any, of the bank against the obligor after netting all exposures and collaterals at their market value on date of liquidation.
+	Advances	Advances include additional funding extended post default with intention to help improve the borrower's financial condition as well as additional money drawn by the borrower as part of a revolving facility.

Costs

Costs	Global Credit Data captures direct costs including legal expenses, administrator or receiver fees, liquidation expenses and other external workout costs. These cost types are collected as separate items. Internal costs are not included.
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REAL ESTATE TYPE

GCD members provide several details on the collateral type. The granular types of collateral are available to the members and have been aggregated for the purpose of this analysis in the following way:

Residential Houses	Residential Houses
Residential Flats	Residential Flats
	Multi-Family Houses or Condominium
	2-4 Unit Multifamily Residential
	4 Plus Multifamily Residential
	Mobile Home Park
Industrial	Industrial
Offices	Office
	Business Hotel
Bare Land	Bare Land (due for Development)
	Entitled Land
Retail	Retail (excl. Shopping Centre)
	Shopping Centre
	Petrol Station
	Auto Dealers
Agricultural	Agricultural
Hotels	Hotel and Aparthotel
Hospitals	Hospital, Clinic, Health Centre
	Nursing Home
Other	Warehouse Logistics
	Car park

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Leisure (Clubs, Outdoors)
Public Services Utilities
Public Services Schools, Universities
Other Public Services
Self Storage
Other

REFERENCE DATA SET

Reference Data set (RDS) refers to the data set after application of filters which is used for the analysis.

REGION

The GCD data set offers country information on several levels (country of residence, country of jurisdiction, collateral country of jurisdiction). The items are collected on country level and returned on country level unless there are less than three banks providing data in a certain country. In this case the countries are aggregated to regions until the minimum requirement of three banks are met. This rule was established to protect anonymity of the lender identity. In this report country information is aggregated on regional level. The regions displayed are

- Africa & Middle East
- Asia & Oceania
- Europe
- North America
- Latin America

For real estate collateral GCD furthermore collects post codes on a “give to get” basis.

RESOLUTION DATE

Generally, a default can resolve because of three reasons: first, the borrower pays back all the debt, second, the borrower returns to a non-defaulted status or third, the bank decides to stop the recovery efforts and writes off the outstanding debt (or sells it). The resolution date is an input field in the GCD database.

RESOLVED/UNRESOLVED

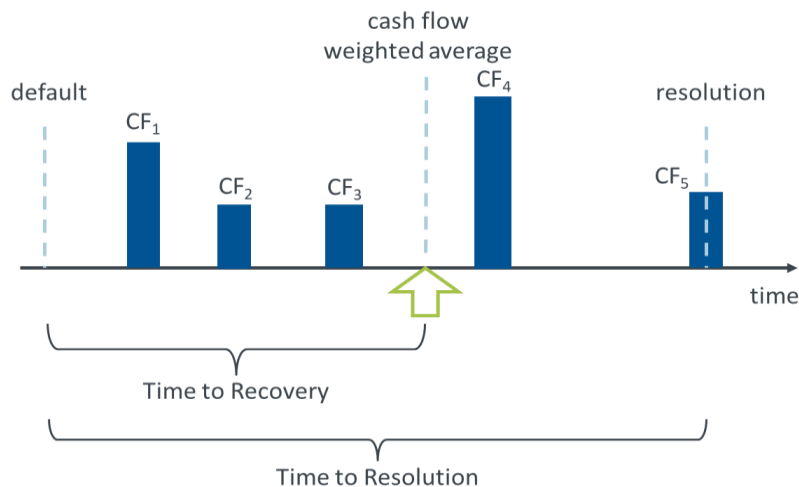
Defaults are considered as ‘unresolved’ where banks are still expecting further cash flows. All other cases where the lending bank has closed the recovery file are considered ‘resolved’. This is an input field in the database.

TIME TO PEAK RECOVERY

Time to peak Recovery is calculated as the centre point of recovered cashflow, and it puts a weight of the amount of the cashflow on the timing. It is defined as the cashflow weighted average period between default and cashflow. The following picture visualises the concept. The cash flow weighted time or average year of cash flow represents the weighted average of all relevant points in time between default and resolution where cash flows took place. Time to peak Recovery is by definition lower or equal to Time to Resolution.

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EXHIBIT 1
CONCEPT OF TIME TO PEAK RECOVERY AND TIME TO RESOLUTION



4. Reference Data Set (RDS)

4.1. Why and how to create an RDS?

GCD provides members with the full “raw” data set when returning data to members after the validation and auditing process. No filtering or data cleansing is done. Banks are advised to create a reference data set (RDS) from the full data set which is a subset of observations from the full data set (borrower, loans, collateral) that should resemble the referenced portfolio.

The RDS can be used for modelling the credit risk of a portfolio, benchmarking a portfolio and validation or calibration of a model for a certain target (referenced) portfolio. This RDS should have two qualities: representativeness and data quality. The creation of a RDS is the key success factor for using pooled data.

4.2. Representativeness of data

Many regulators have set standards¹ or guidelines for data to be used in credit risk estimation models. Such guidelines cover both internal and external data. In both cases the data used needs to be representative of the target portfolio during the proposed measurement time. Even internal data from a different time period, jurisdiction or sub-portfolio should be assessed for representativeness.

The total GCD defaulted borrower data set is composed of data from the banks who have chosen to be GCD members. These banks’ geographical lending footprint, loan and borrower types as well as collateral practices

¹ Some examples of regulatory requirements for representativeness include:

BCBS: Basel II §417, §450 and §448

European CRR: Articles 174, 179 and 185

UK PRA Internal Rating Based Approach (SS11/13) Article 10.12

EBA Guidelines on PD Estimation, LGD Estimation and Treatment of Defaulted Exposures Section 4.2.2.19

ECB’s Targeted Review of Internal Models (TRIM): Section 6.2, paragraph 57 (d)(iii) and Section 2.1

US Federal Reserve: SR11-7

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are merged in the database. Due to the size and long time series of the database and the contributions from banks of many countries, the data set could be seen as broadly representative of an average bank, however more accurately it represents the average of GCD member banks, weighted towards the largest member banks who provide most data. Details of GCD member banks, including geographical footprint of the data, are given on the GCD website.

NO STANDARD GCD RDS

The purpose of creating an RDS is to match as closely as possible the risk conditions of a target portfolio of a single bank. Therefore, a single standard RDS could not possibly suit all users. In this report GCD bases the analytics on a filtered data set which combines elements of representativeness and data quality.

Again, the capability of member banks to be able to narrowly define a data set aligned to the reference model significantly improves the comparability and validity of the benchmarking exercise and addresses benchmarking challenges such as differing portfolio composition, processes and policies, default definitions, weighting schemes and so forth.

4.3. Elements of the RDS in this study

The full database of Real Estate related loans contains 83,726 defaulted facilities. 57,263 facilities remain in the reference data set after applying filters. The different elements and the reasons for filtering are explained below.

UNRESOLVED CASES: CAN THE ULTIMATE RECOVERY RATE BE CALCULATED?

Recovery Rate is most accurately calculated on closed (resolved) cases, where the outcome is anything from full repayment to complete loss, or something in between. Although GCD collects unresolved cases, the ultimate Recovery Rate cannot be calculated until the default is resolved. To avoid uncertainty by calculating proxies for unresolved cases, the RDS is restricted to resolved cases.

TABLE 1
REFERENCE DATA SET CREATION

Filter	Stage	Unresolved	Year of Default	Small Default Amount	Incomplete Portfolio	Validation Rules	Nr of facilities	Total
Raw data set w/o filters	initial	4,989	2,671	11,921	8,877	1,194	3,794	83,726
Unresolved	before	4,989	2,671	11,921	8,877	1,194	3,794	83,726
Unresolved	after	0	2,105	11,427	8,185	1,055	3,457	78,737
Year of Default	before	0	2,105	11,427	8,185	1,055	3,457	78,737
Year of Default	after	0	0	11,082	8,185	984	3,280	76,632
Small Default Amount	before	0	0	11,082	8,185	984	3,280	76,632
Small Default Amount	after	0	0	0	5,804	453	2,472	65,550
Incomplete Portfolio	before	0	0	0	5,804	453	2,472	65,550
Incomplete Portfolio	after	0	0	0	0	361	2,207	59,746
Validation Rules	before	0	0	0	0	361	2,207	59,746
Validation Rules	after	0	0	0	0	0	2,122	59,385
Nr of facilities	before	0	0	0	0	0	2,122	59,385
Nr of facilities	after	0	0	0	0	0	0	57,263
RDS	final	0	0	0	0	0	0	57,263

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YEAR OF DEFAULT: HOW TO AVOID THE RESOLUTION BIAS

An important distinction should be identified and accordingly addressed with respect to cases with a short workout period when calculating Recovery Rate. Generally, a short workout period is related to higher recoveries. In the most recent years short workout period cases are naturally overrepresented. This is known as resolution bias. Hence, including all the default years might lead to an unrealistically long-term average Recovery Rate. Therefore, when creating an RDS it is advisable to address the resolution bias by restricting the defaults to those with a reasonable window time for workout processes to conclude. The decision on this filter, like all RDS filters, should be left to the discretion of users and be aligned to what is representative of their own portfolio. For the GCD dataset the average observed workout period is two years and the latest default year available in the LGD/EAD database is 2019. To address the resolution bias caused by cured cases, it is reasonable to restrict data points to defaults up to and including 2016.

A filter is applied on the lower end of the time series in addition to the filter on the upper end. Although the earliest entry in the GCD database dates back to 1983, for some banks it is difficult to deliver all the data elements required to identify cured cases for older defaults consistently with newer defaults. Such data may still be useful for driver analysis but the lower reported cure rate can tend to bias the resulting pre-2000 data such that the reported Recovery Rate is lower than it would have been in a full data set. In this report where the absolute level of the resultant recoveries is important because long term averages are calculated, defaults that occurred prior to 2000 are excluded.

SMALL DEFAULT AMOUNT: ARE SMALL DEFAULT AMOUNTS RELEVANT?

Default amounts in the GCD database range from zero (e.g. for uncalled contingent facilities) to several hundreds of millions of Euro. For an appropriate setup, banks are advised to compare the default amount structure to their internal portfolio. For this exercise default amounts below 100,000 EUR are excluded as they are deemed to be not representative of large corporate defaults.

INCOMPLETE PORTFOLIO: HOW TO DEAL WITH FORMER MEMBER BANK DATA

When a member bank resigns from the association and/or from a Data Pool, the most recent defaulted years that they have submitted must be incomplete as they would no longer participate to submit/update their defaults. The incomplete data contains only cases with short time to resolution which might be affected by the resolution bias. Therefore, the last three years of data of former member banks are filtered out of the RDS.

VALIDATION RULES: HOW TO DEAL WITH OLDER DATA

As described above, GCD applies a series of validation rules during the submission process which prevents inconsistent or incomplete data from being accepted automatically. This is the major data quality insurance that protects the database. The validation rules are updated and amended as required by our members for every submission. That said, some entries were integrated into the database before certain validation rules had been implemented. Those entries can still be part of the database if not updated by the member bank. GCD policy is to not remove any data as it may still contain useful information. However, for this exercise, data points with errors that affect the integrity of the database (e.g. the event date at default must be the same for all facilities of a given borrower) or the correct calculation of Recovery Rate (e.g. balancing the cash flow between the transaction and the history table) were excluded. Due to the GCD rule that every bank must update their full data submission at least every three years, there are only a small number of entries removed in this filter step.

The remaining validation rules that are triggered deal with completeness. They check e.g. if for a certain collateral type, year of construction is given. Where data was submitted before the rule was applied, the

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information is sometimes not provided. Since that data is not wrong it is included in the RDS. Correctness items check for example, if several connected fields are consistently filled: such as if for a syndicated loan a total syndicated amount and a currency are given. If they do not deal with crucial information used in this report the data is included in the RDS.

NUMBER OF FACILITIES PER BORROWER: HOW TO DEAL WITH FACILITY WEIGHTING EFFECTS

Borrowers with many loans which might cause overweighting are removed. The 60% of the full dataset for corporates consists of one facility per borrower. About 98% of the dataset has less than 10 facilities attached to one borrower. There are outliers with over 200 loans attached and these lower the overall average Recovery Rate due to the bimodal left skewed shape of the distribution. These are verified loan constructions which relate to specific commercial circumstances including multi-family housing with one home per apartment or equipment finance with one loan per vehicle in a fleet. Inclusion of these would overweight the importance of a single collateral. Therefore, for more homogeneity, a filter on borrowers with 10 or more facilities is applied at obligation level.

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For additional information, please contact

Nunzia Rainone

Analyst & Member Support Executive
nunzia.rainone@globalcreditdata.org

Nina Brumma

Head of Analytics and Research
nina.brumma@globalcreditdata.org

www.globalcreditdata.org

