Global Credit Data
by banks for banks

PD Benchmarking Report 2019
Internal ratings, transitions and observed default rates collected from GCD contributing member banks

ABOUT GCD

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 started collecting historical loss data in 2004, to which member banks have exclusive access. This database now totals over 185,000 non-retail defaulted loan facilities from around the world.

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 place our databases as the global standard for credit risk data pooling.

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SUMMARY

- In this **public** report **Long-Term Internal Observed Default Rates** and **Internal Rating Migration matrices** are consolidated from **corporate loan** portfolios of 26 leading financial institutions.

- The collected information plays a significant role in benchmarking key risk processes within banks: PD rating scale calibration, PD model calibration, regulatory and economic capital calculation, stress testing, IFRS 9 and CECL impairment modelling, to name a few.

- **Key insights from the public report:**

  o Reflecting specific risk profiles and business models banks' **internal rating scales are diverse and PD estimates per rating category vary.**

  o **Internal PD estimates used for regulatory purposes** are typically **conservative** when compared with realized default rates**.** This report focuses on the global corporate segment[1]. Between 2004 and 2018 the estimated PD (1,63%) of this segment has far exceeded the average default rate (0.90%).

  o The **default rate of this global corporate segment has fallen year-on-year**, from 1.12% in 2016 to 0.73% in 2018 . While this may look positive, it is also consistent with concerns of a growing corporate debt bubble. An influx of newly issued debt from lower-rated issuers could be driving down short-term default ratios while likely driving default risks higher in the longer term.

  o Banks are required to compare their internal rating scales with reliable benchmarks. **Banks' internal observed default rates and rating transition matrices behave differently from those established by credit rating agencies ('CRAs', e.g. Standard & Poors),** due to the specific underlying instruments (loans for banks vs. bonds for CRAs), wider coverage of counterparties (internally rated borrowers for GCD vs. externally rated borrowers for CRAs) and a different sensitivity of the rating system to the macro-economic cycle[2]. When comparing the chosen segment e.g. with Standard & Poors, we observe:

    ▪ The GCD default rate curve is more conservative (default rate per grade higher) for investment grades and less conservative for non-investment grades than the S&P default rate curve provided in their public report.

    ▪ The default rates of the GCD global corporate segment present a lower volatility in comparison with S&P.

- **GCD's PD dataset comprises historical data far beyond the segment presented in this report**. GCD collects default information for various other types of low default portfolios such as Funds, Project Finance, Ship Finance, Commodity finance etc. Members have access to all data based on a well-defined "give-to-get principle".

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1 Segment created for this public report and composed of large corporates from various industries, banks and financial institutions. Further split down into segments available for members.
2 Also known as "point-in-time"-ness of the rating system or stability of the rating system

INTRODUCTION

With the *Probability of Default (PD) & Rating Platform,* Global Credit Data (GCD) provides a unique data source which allows banks to anonymously compare their PDs and observed default rates with peers for different types of credit loan portfolio segments:

- Small and Median Enterprises (SME),
- Large Corporates,
- Banks & Financial Institutions (incl. Funds),
- Specialized Lending (Aircraft, Shipping, Real Estate, Commodity Finance, Project Finance)
- Sovereigns and Municipalities
- Public Finance and
- Private Banking.

The database covers 15 years of data and is detailed and rich enough to be used for **validation, calibration and benchmarking** of internal PD models and masterscales.

The process is straight-forward: GCD collects banks' ratings used for regulatory capital purposes for certain type of borrowers plus the default status following the Basel default definition. Based on that, GCD is able to calculate default rates and internal rating transition matrices using a "cohort approach", a standard technique which follows a borrower and its rating development over time. The methodology is applied to all participants' data consistently ensuring comparability between banks' data. It includes practices on how to deal with, for example, double defaults, exits from the portfolio and new borrowers and is in line with common practice in banks, external rating agencies and most recent guidelines from regulators.

As of today, the database is comprised of data from 26 globally operating banks (see Exhibit 1).

EXHIBIT 1
COUNTRY OF PARTICIPATING BANKS

Region	Main country	Number of participating banks
Europe	Austria	1
	France	1*
	Germany	1
	Italy	1
	Netherlands	4
	Norway	1
	Switzerland	1
	Denmark	1
	Sweden	3
	United Kingdom	2
Asia / Oceania	Australia	3
North America	US	2
	Canada	3
Africa	South Africa	2
		26

(* another French bank contributed. Data verification is ongoing)

SELECTION OF DATA

This report zooms into the global corporate segment, consisting of **large corporates** (>€50m consolidated turnover) **from various industries, including banks & non-bank financial institutions**. Similar information is available for other segments and low default portfolios.

The selected data includes information from (on average) 130,000 borrowers and covers the rating history from 2004 to 2018 (see Exhibit 2).

EXHIBIT 2
NUMBER OF BORROWERS AND DEFAULTS

Year	Performing Borrowers	Observed Defaults
2004	40,808	161
2005	48,588	198
2006	62,272	167
2007	95,297	523
2008	103,799	789
2009	125,228	1,483
2010	186,998	1,548
2011	178,027	1,698
2012	192,702	1,713
2013	186,139	1,409
2014	173,560	2,197
2015	197,276	2,018
2016	192,199	2,145
2017	149,407	1530
2018	112,343	831
Average	136,310	1,227

The data reflects the portfolios of the participating banks, with most of the data - as expected for banks' lending portfolios - in rating classes BBB and BB (see Exhibit 3) .

EXHIBIT 3
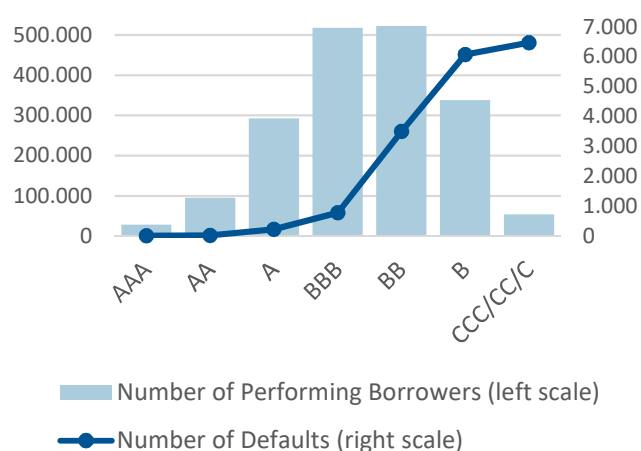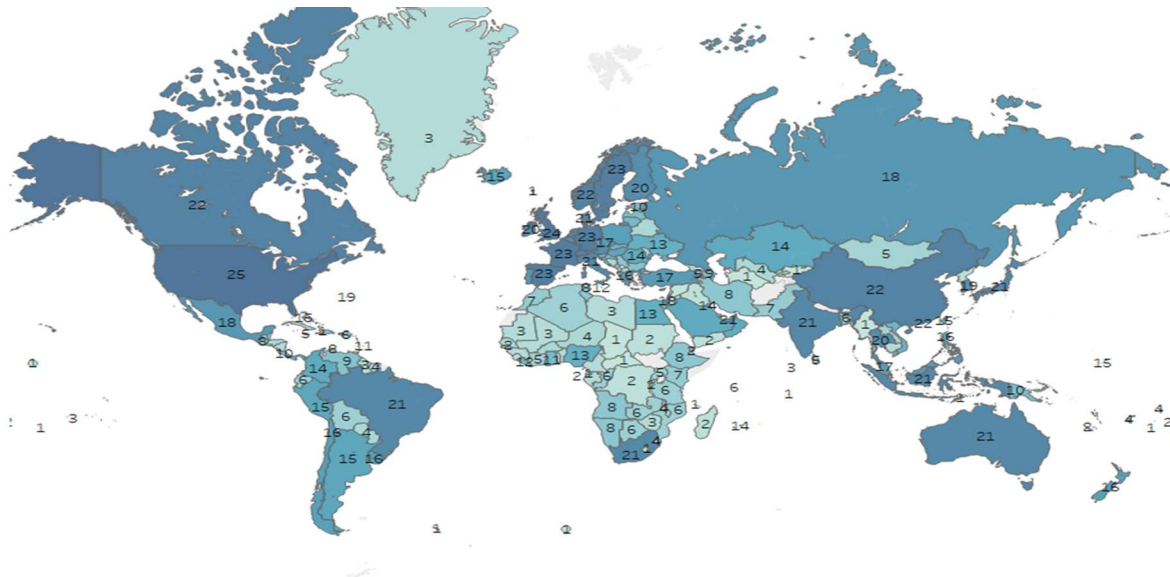### NUMBER OF BORROWERS AND **DEFAULTS, BY RATING**

Exhibit 4 (see page 3) shows the deep global coverage of this database, displaying the number of participating banks with a portfolio in a certain country.

EXHIBIT 4
GEOGRAPHICAL DISTRIBUTION: NUMBER OF BANKS DELIVERING DATA, BY COUNTRY OF RESIDENCE OF THE BORROWER

VARIATION IN BANKS' RATING MASTERSCALES

Banks differ in the number of rating grades and their PDs per rating class due to the heterogeneity of their risk profiles and business models. When delivering data to GCD, banks are required to map their internal rating system categories to a S&P rating category allowing a comparison of banks' rating scales. Exhibit 5 and Exhibit 6 display the overall, average PD (and the 25% and 75%-quantile of the PD) per rating, showcasing the (expected) variability between banks.

EXHIBIT 5
COMPARISON BETWEEN PD AND DEFAULT RATE PER RATING CLASS

Number of Borrower (right scale)

Average PD (left scale, including 1st and 3rd quartile)

Average default rate (left scale)

EXHIBIT 6
COMPARISON BETWEEN PD AND REALIZED DEFAULT RATES PER RATING CLASS

	Nr Banks	1st Quartile PD	Average PD	Median PD	3rd Quartile PD	Average Default Rate
AAA	21	0.01%	0.02%	0.01%	0.03%	0.04%
AA	25	0.03%	0.03%	0.03%	0.04%	0.03%
A	26	0.06%	0.08%	0.08%	0.09%	0.08%
BBB	26	0.24%	0.27%	0.26%	0.31%	0.15%
BB	26	0.92%	1.04%	1.04%	1.22%	0.50%
B	26	3.58%	4.38%	4.16%	5.28%	1.80%
CCC/C	26	15.73%	20.42%	19.69%	23.40%	12.12%

Risk quantification is specific to each bank and reflects the individual portfolios strategies, underwriting policies and differing views on the credit risk of individual counterparties. Therefore, it is not surprising to see variation in the PD calibration of the rating classes. Continuous benchmarking enables banks to check their risk estimates against those of their peers, identify the causes of variability, and focus in on what constitutes an acceptable level of variability.

Both exhibits show the "grouped" rating classes (AAA, AA, A, …) but members receive the full underlying data and have access to the more granular rating grades (AAA, AA+, AA, AA-, A+ …). Each rating grade comprises data from at least 21 banks, confirming the robustness of GCD's data.

Note: the benchmarked PD is banks' regulatory PD stemming from their rating systems, before applying any regulatory minimum values.

## BANKS' PD CALIBRATION MORE CONSERVATIVE THAN OBSERVED DEFAULT RATE

Banks provide their regulatory PD per borrower to GCD, which is considered to be a long-term estimate and based in many cases on a "through-the-cycle rating (TTC) methodology". For a more detailed comparison of banks' data in the context of a "point-in-time (PIT)" vs "through-the-cycle (TTC)" see page 8.

Overall, the data demonstrates a conservative approach within banks (calibrated PD > observed default rate) for the chosen global corporate segment (=global large corporates with a consolidated turnover larger than €50m, including banks and financial institutions), as banks' PD estimates typically include a "margin of conservatism" for estimation errors and data constraints. In the AAA rating class (see Exhibit 6) the default rate exceeds the modelled PD, explained by (unexpected) defaults in the early days of the financial crisis.

Through rating adjustments and recalibrations the average PD at portfolio level changes over time (see Exhibit 7). In the economic recession year of 2009 the default rate rises, as does the PD. The average PD of the data set (1,63%) exceeds the default rate (0.90%) significantly over the whole observation period. It should be noted that banks also incurred default rate levels in 2009 that were higher than the average PD shown here and indeed higher than their own PD levels.

Participants to this data collection are able to use the pooled data to determine the "level of conservatism" of their own rating systems in comparison to other banks.

EXHIBIT 7
COMPARISON BETWEEN PD AND DEFAULT RATE PER YEAR

- Number of Borrowers (right scale)
- Average PD (left scale)
- Average Default Rate (left scale)
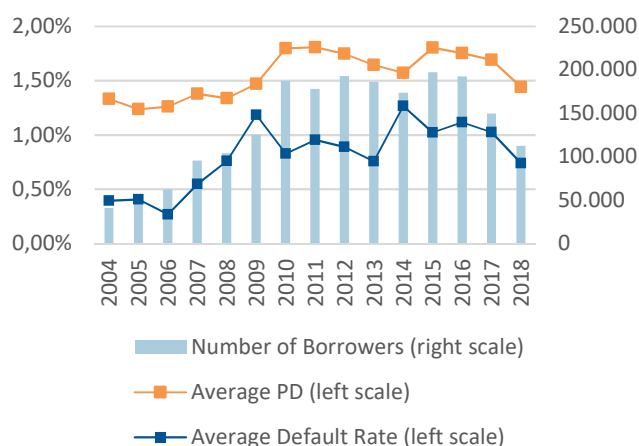
BENCHMARKING INTERNAL RATINGS WITH EXTERNAL RATINGS

It is an accepted convention to benchmark internal ratings, internal PD calibrations and observed internal default rates, with external ratings and external defaults rates made available by credit rating agencies ("CRAs"). However there are differences between the scope of a banking portfolio and the scope of companies under watch of rating agencies.

GCD's PD dataset covers historical data from 1995, with a majority of the data starting in 2004. With an average of 130,000 borrowers per year, GCD's PD data pool has a significantly wider coverage than other typical benchmark portfolios. To name one: S&P default rates are published on an average of 6,000 issuers.[1]

EXHIBIT 8
GCD VS S&P NUMBER OF BORROWERS/ISSUERS

- GCD Number of borrowers
- S&P Number of issuers
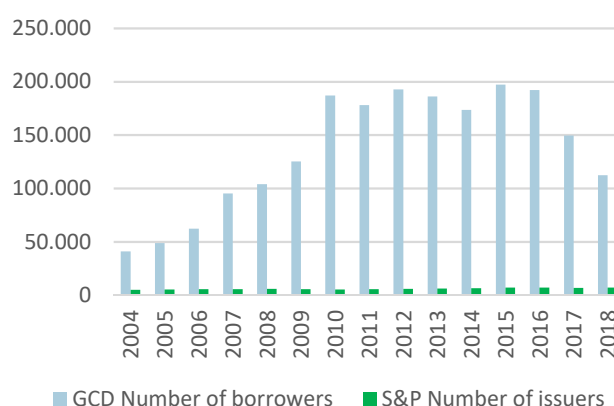
Recent regulatory guidance suggests to assess the consistency between internal data and external data used for benchmarking. The usual drivers contemplated by banks are obligor/exposures specificities, geographic distribution, portfolio/rating distribution, default definition and the alignment of the underlying rating philosophy between internal data and data from the benchmark.

Internal ratings synthetize the idiosyncratic and contextual risks a bank faces when it bears an exposure to a specific obligor. External rating captures the idiosyncratic and contextual risk of the same obligor without any notion of exposure or banking relation, and targets a more distant time horizon.

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[1] Source: 2018 Annual Global Corporate Default And Rating Transition Study, by S&P Global Direct, published on April 9th, 2019
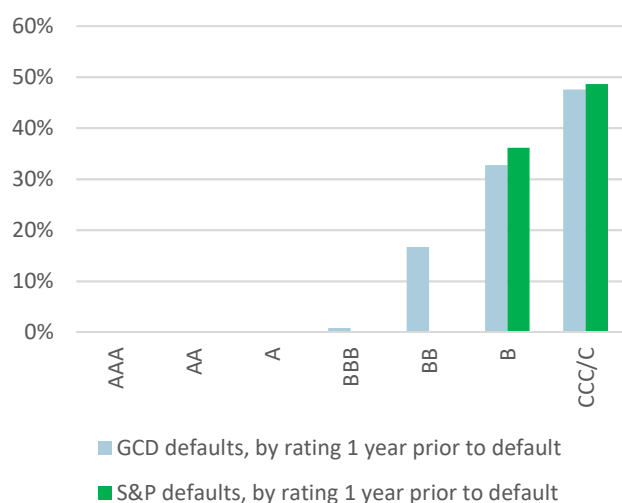
The effect of this difference is showcased by GCD's data.

- The rating distribution of externally rated issuers is typically more progressive than banks' lending books, as only issuers with a certain credit quality gain access to the capital market. External ratings have a higher concentration in the ratings AA and A. Banks' internal portfolios have a higher concentration in the BB grades (see Exhibit 9)
- External ratings typically show a higher number of defaults from the CCC/C or B rating classes, while internal defaults are also stemming from BB or even better ratings 1 year prior to default (see Exhibit 10).

EXHIBIT 9
GCD VS S&P RATING DISTRIBUTION

- GCD % of borrowers per rating
- S&P % of borrowers per rating

EXHIBIT 10
GCD VS S&P DIFFERENCES IN DEFAULT DISTRIBUTION

- GCD defaults, by rating 1 year prior to default
- S&P defaults, by rating 1 year prior to default

INTERNAL GCD DEFAULT RATE CURVE LESS STEEP COMPARED TO EXTERNAL S&P DEFAULT RATE CURVE

The internal default rate curve of GCD's global corporate segment is more conservative (default rate higher) for investment rating grades and less conservative for non-investment grades than the external default rate curve provided in the public S&P report[2]. With other words, the GCD default rate curve is less steep than the S&P default rate curve.

These differences may be rooted in the different scope of the data as explained in the previous section. The result is a difference of the long-term default rates per rating grade, especially in the rating category "B" to "C", where internal default rates are significantly lower than external default rates over the same time span (2004 to 2018) - a observation we see consistently over time and various subsegments.

EXHIBIT 11
COMPARISON OF DEFAULT RATES BETWEEN S&P AND GCD 2004 TO 2018

		Average Default Rate GCD	Average Default Rate S&P
AAA	21	0.04%	0.00%
AA	25	0.03%	0.03%
A	26	0.08%	0.05%
BBB	26	0.15%	0.10%
BB	26	0.50%	0.34%
B	26	1.80%	2.47%
CCC/CC/C	26	12.12%	23.89%

The data demonstrates also that default rates from internal ratings fluctuate structurally less than those from external ratings. Exhibit 12 shows the default rate of the S&P and GCD dataset for the various rating grades over time. The difference in volatility is seen especially in the risk grades AA, BBB, B and CCC/C.

Lower volatility is expected when data volumes are increased: GCD data has 20 times more underlying borrowers than S&P data contains issuers. External ratings are also considered more stable (given their signalling character to the market, see also the following section on transition matrices) which leads to a higher variation of default rates per rating category.

EXHIBIT 12
GCD VS S&P DEFAULT RATES BY YEARS AND RATING
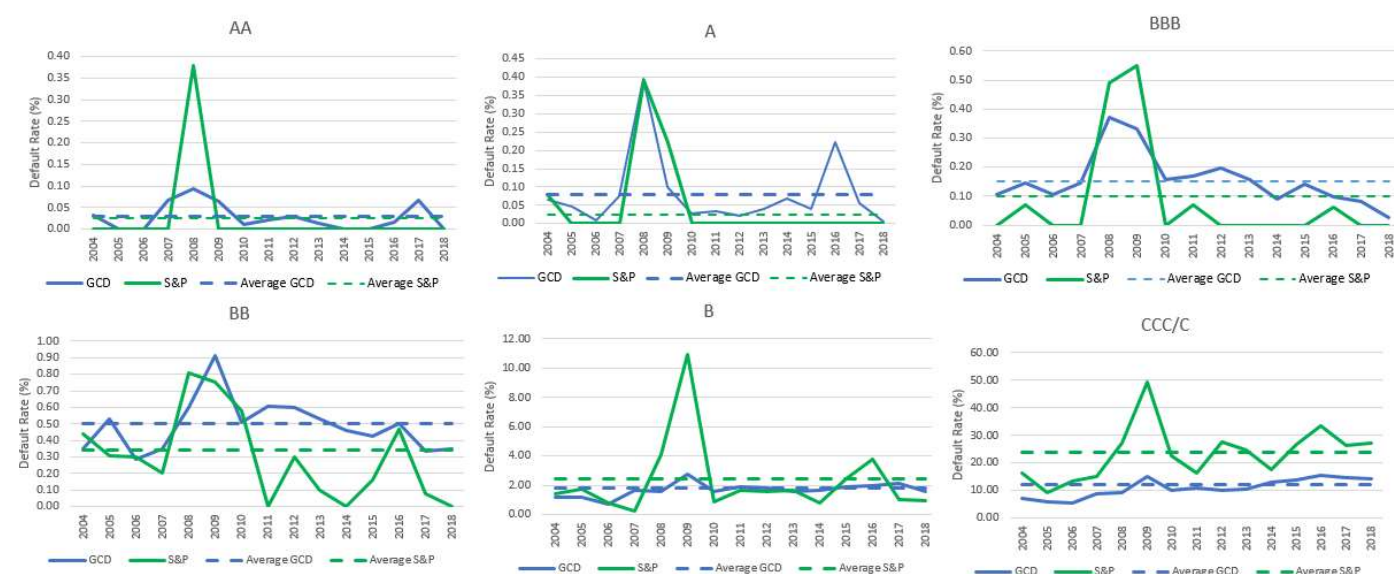
GCD member banks receive the full underlying dataset and can use the pooled data to create a representative benchmark when calibrating their low default portfolios and when looking for historic volatility in comparison to macroeconomic events, for example when performing stress tests and modelling forward-looking expected loss for IFRS 9 and CECL.

INTERNAL TRANSITION MATRICES ARE MORE VOLATILE THAN EXTERNAL TRANSITION MATRICES

Credit transition matrices ("CTMs") are a key element in many credit risk processes. Transition matrices show the frequency (in %) of upgrades and downgrades from one rating category to another by comparing the rating of the borrower at the beginning with the rating at the end of a specific period.

GCD's PD dataset includes various types of transition matrices:

- Quarterly transition matrices
- 1-year transition matrices
- Multi-year transition matrices

Exhibit 13 and 14 display the long-term average 1-year transition matrices of GCD and S&P, covering the maximum available history of both datasets.

A transition matrix can be read as follows (e.g. GCD transition matrix): on average, of all borrowers with a AAA-rating at the beginning of the year, 79% hold the same rating (AAA) at the end of the year, 8.98% of the borrowers were downgraded to AA at the end of the year, 0.58% were downgraded to A etc.

Transition matrices typically include a 'Not Rated' ("NR") category:

GCD's internal transition matrices differ between a counterparty not receiving a rating ("no rating") and a portfolio exit ("exit"). The first indicates the bank was not able to assign a rating for any reason, the second that the borrowers have "moved out" of the observed cohort for various reasons (repayment, default, change of asset class/portfolio, merged with another borrower, …).

External ratings can only be withdrawn and receive the status "NR" in situations of lacking cooperation between the issuer and the credit risk agency *"particularly when a company is experiencing financial difficulties and refuses to provide all the information needed to continue surveillance on the ratings, or at the entity's request."[3]*

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[3] 2019 Annual Global Corporate Default And Rating Transition Study, by S&P Global Direct, published on April 9th, 2019

EXHIBIT 13
GCD 1-YEAR AVERAGE TRANSITION MATRIX 2004 TO 2018 (IN %)

From/to	AAA	AA	A	BBB	BB	B	CCC/C	D	NR	Exit
AAA	79.00	8.98	0.58	0.33	0.04	0.09	0.01	0.01	0.03	10.94
AA	4.45	71.28	6.97	2.66	0.40	0.15	0.04	0.02	0.08	13.94
A	0.11	2.59	68.32	9.68	1.49	0.34	0.06	0.09	0.09	17.23
BBB	0.02	0.26	4.88	65.56	9.95	1.13	0.15	0.16	0.05	17.83
BB	0.01	0.08	0.50	7.46	61.45	6.80	0.67	0.54	0.04	22.46
B	0.02	0.06	0.30	1.39	12.76	51.99	3.22	1.82	0.13	28.31
CCC/C	0.03	0.12	0.21	0.65	3.79	14.16	39.66	11.78	0.56	29.03

EXHIBIT 14
S&P 1-YEAR AVERAGE TRANSITION MATRIX 1981 TO 2018 (IN %)

From/to	AAA	AA	A	BBB	BB	B	CCC/C	D	NR
AAA	86.99	9.12	0.53	0.05	0.08	0.03	0.05	0	3.15
AA	0.5	87.06	7.85	0.49	0.05	0.06	0.02	0.02	3.94
A	0.03	1.69	88.17	5.16	0.29	0.12	0.02	0.06	4.48
BBB	0.01	0.09	3.42	86.04	3.62	0.46	0.11	0.17	6.1
BB	0.01	0.03	0.11	4.83	77.5	6.65	0.55	0.65	9.67
B	0	0.02	0.08	0.17	4.93	74.53	4.42	3.44	12.41
CCC/C	0	0	0.11	0.2	0.59	13.21	43.51	26.89	15.5

When comparing the GCD and S&P transition matrices, we confirm that 1) across all rating grades, the S&P dataset shows a much higher rating stability. and 2) in both datasets better ratings tend to be more stable than lower ratings.

Exhibit 15 provides a comparison of the green element on the diagonal of the transition matrices shown in Exhibit 13 and 14 supporting these two observations.

Another observation is that (internal) banking portfolios do not remain stable over time. On average 20% of the borrowers leave the cohort at the end of the cohort window (see column "Exit" in Exhibit 13 and displayed in blue in Exhibit 16). The percentage of "withdrawn" external ratings (see column "NR" in Exhibit 14 and displayed in green in Exhibit 16) is significantly lower.

EXHIBIT 15
LEVEL OF RATING STABILITY

EXHIBIT 16
PORTFOLIO EXITS / NON-RATED, BY RATING
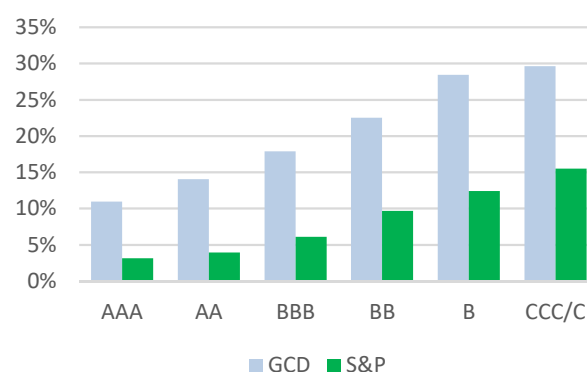
BANKS VARY IN THE "PIT-NESS" OF THEIR RATING SYSTEMS

The "degree of point-in-time (PiT)-ness" of a bank's rating model is defined as the degree of sensitivity of the model estimate to the influence of the business cycle. Alternative wordings in the literature are "level of PIT-ness" and "level of sensitivity to the credit cycle".

Measuring the "PIT-ness" of a rating system is challenging (see detailed GCD study available for members). The "average migration volume" and the "average migration drift" can be considered as a good proxy for assessing the level of "PIT-ness" of a rating system, defined as follows:

Migration volume per year =

"Number of up- and downgrades in a certain year"

divided by

"Number of performing borrowers beginning of the year"

Average Migration volume of a bank:

Average of the "migration volume per year" over the total available timespan

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Migration drift =

Absolute value of

("Number of upgrades in a certain year" - "Number of downgrades in a certain year")

divided by

"Number of performing borrowers beginning of the year"

Average Migration drift of a bank:

Average of the "absolute migration drift per year" over the total available timespan

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We confirm that banks show different migration behaviours given their different rating systems and portfolio distributions. The "average migration volume" ranges between 10% and 60% and the "average migration drift" ranges between 2% and 14%. Banks with a higher migration volume usually also have a higher migration drift.

EXHIBIT 18
"MIGRATION VOLUME" VS "MIGRATION DRIFT (ABSOLUTE VALUE) " OF PARTICIPATION BANKS
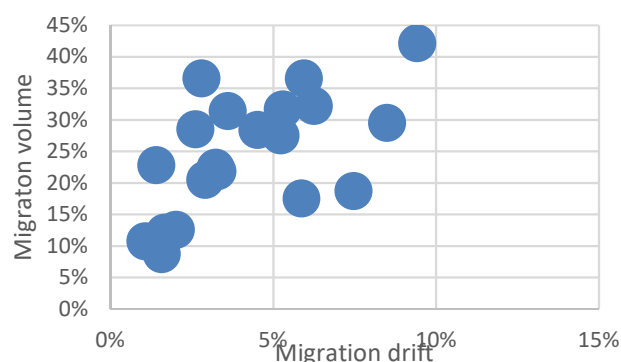
CONCLUSION

For this study, a special reference data set was designed, named the GCD global corporate segment. Similar analytics can be performed on other segments or subsegments of the GCD dataset.

Overall, we conclude:

- **Banks vary in their internal PD estimates per rating class ('masterscales')**. Joining the datapool allows banks to compare their masterscale PD anonymously to those of other banks.

- **Banks' long-term, "through-the-cycle" PD estimates** are typically **more conservative** than the observed default rates.

- The **observed default rates of the GCD dataset are based on a broader dataset** (on average 130,000 borrowers) **than S&P default rates** (on average 6,000 issuers) **and less volatile** due to the specific underlying instruments (loans for banks vs. bonds for CRAs), wider coverage of counterparties (internally rated borrowers for GCD vs. externally rated borrowers for CRAs) and a different sensitivity of the rating system to the macro-economic cycle[2].

- **Banks vary in their level of "PIT-ness"**. Continuous benchmarking enables banks to assess the level of stability of their transition matrices.

- Historically low default rates could be explained by **easier access to funding and higher debt levels,** permitted by historically low interest rates and the necessity for banks to find yield. However, in the longer term, this could be consistent with rising corporate debt – and even a corporate debt bubble. Record levels of debt being issued today could, given a downturn macroeconomic environment, for instance, turn to high levels of default, especially if the majority of this new debt is issued by BB and lower-rated companies (exhibit 9).