# Transition / Default Matrix 2017

**INDICE**

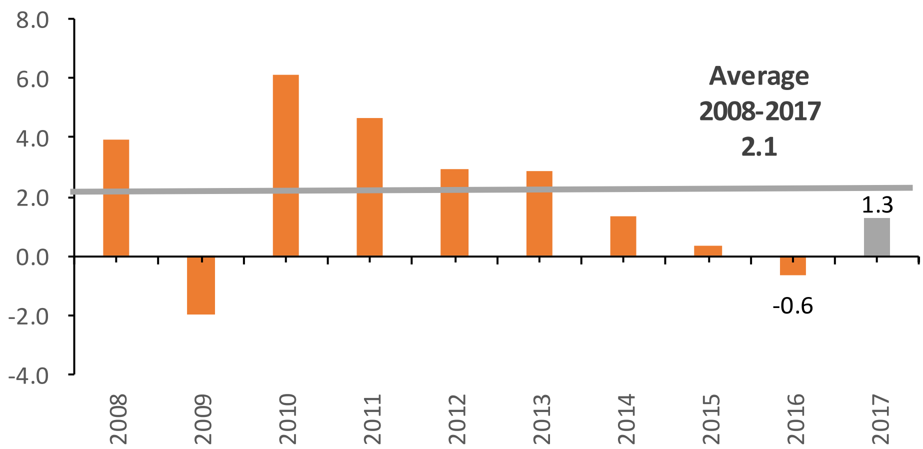
## 1. Introduction

Rating transition/default matrices[1] (also referred to as "credit migration matrices") play an important role in credit risk management. Probabilities associated with ratings transitions, in particular the probability of default, which is an essential input to calculate expected loss and economic capital. This concept is so crucial in the calculation of requirements capital under the Basel framework. Concerning investments, these matrices enable the comparison and forecast of the level of exposure to losses caused by default and devaluation due to credit spread movements. Consequently, they are cardinal inputs for financial applications such as portfolio risk management or the valuation of bonds and derivatives.

Pacific Credit Rating (PCR) prepares periodically the transition/default matrix using ratings assigned by all subsidiaries and strategic partners[2]. The following summary will show the main findings of the assessment and analysis made with the transition/default matrices worked and obtained for 2017 and up to 2017.

According to International Monetary Fund[3] The economies of Latin America and the Caribbean will growth at a rate of 1.3% in 2017, up from -0.6% in 2016. However, during the period 2014-2017 the economy of Latin America and the Caribbean was affected by the decrease in the price of commodities. Thus, the IMF expects growth in the 2018 and 2019 to be 1.2% and 2.2%, respectively. This rebound in Latin America growth would be driven by domestic demand and private consumption. Meanwhile, the recovery of the Caribbean region will be due to the reactivation of tourism encouraged by the higher growth of the United State of America.

**GDP Growth Latin America and the Caribbean**




Source: FMI

[1] Created by the Russian mathematician “Andrei Markov” in his 1907 publication.
[2] Pacific Credit Rating (PCR) has subsidiaries in Bolivia, Perú, Ecuador, Panama, Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala y Mexico as a strategic partner.
[3] International Monetary Fund, World Economic Outlook Update, April 2017.

## 2. Transition / Default Matrix 2017

In this scenario, in 2017 the total number of ratings outstanding[4] issued by PCR was to 1459. Companies rated by PCR have reached stable ratings. Likewise, 92.94% of PCR securities were rated with a higher rating (AAA, AA, A, BBB), this performance has been slightly bigger than 2016 with 90.98%.

The probability that the companies evaluated fall into *default* in 2017 was 1.81%. Thus, during the last year PCR has rated two *default*[5] securities (D), compared to 2016, where defaulted securities have not been rated. It is important to mention these securities did not have investment grade an represent entities of the government and corporate sector of México and Ecuador, respectively. The immediately superior grades (C) were 12 unlike the only grade presented in 2016.

Concerning the ratio of downgrades to upgrades that shows the performance of the rating, it was 1.43% of total number of ratings outstanding were upgraded during 2017, a smaller portion than 2016 (2.90%). On the other hand, the downgrades represent 1.15% and 0.27% on 2017 and 2016, respectively.

Then, if we take in count transitions for the whole period of information under analysis (1990 – 2017) and compare to the information aggregated until 2016, it is seemed that 2.51% of total number of ratings outstanding were upgrades until 2017, a more than the 2.23% until 2016. Likewise, downgrades were much smaller with 1.50% and 1.70% until 2017 and 2016, respectively.

To have a reference, during the closer years of real state financial crisis of the United States (2007 and 2009) the ratio of downgrades was duplicated (from 9.3% in 2007 to 19.18% in 2009)[6] and the upgrades fall significantly on a third (from 13.47% in 2007 to 4.81% in 2009).

Besides, a positive relationship between the quality and stability of the credit ratings, the transition rates portray the stability of each PCR credit rating category. In terms of rating actions, as expected, higher-rated credits ("BBB" and higher rating categories) are more stable and subject to fewer rating changes compared with lower grades (non-investment grade), which are more volatile, with more frequent rating actions occurring.

[4] The total number of credit ratings outstanding issued by PCR includes all classes of credit ratings (financial institutions, brokers, or dealer; insurance companies; corporate issuer and public finance) excluding asset-backed securities.

[5] The condition by which PCR classifies obligor, securities, or money market instruments as being in default is when the company has lost its capacity to accomplish with its contractual obligations.

[6] This information was found on the Standard & Poor's report "Default, Transition, and Recovery: 2014 Annual Global Corporate Default Study and Rating Transitions".

On the PCR Aggregate basis, the one-, three- and ten-year transition/default matrix rates for AAA were 71%, 81% and 79% based on inclusion of discontinued ratings as present in the following tables:

## Credit Transition/Default Matrix[7]

**PCR Aggregate - 1-Year Transition and Default Rates**
(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Total Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 137 | 71% | | | | | | | | 16% | 13% |
| AA | 568 | | 78% | 1% | | | | | | 10% | 11% |
| A | 419 | | 1% | 83% | | | | | | 11% | 5% |
| BBB | 232 | | | 5% | 70% | 2% | | | | 9% | 14% |
| BB | 60 | | | 0.7% | 24% | 61% | | | 6% | 1% | 7% |
| B | 31 | | | | 1% | 9% | 67% | | | | 23% |
| CCC | 12 | | | | | | | 26% | 18% | 18% | 37% |
| Total | 1459 | | | | | | | | | | |

Source: Pacific Credit Ratings (2017)

**PCR Aggregate - 3-Year Transition and Default Rates**
(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Total Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 186 | 81% | | | | | | | | 7% | 12% |
| AA | 636 | 1% | 87% | 1% | | | | | | 4% | 7% |
| A | 444 | | 1% | 88% | 1% | | | | | 5% | 5% |
| BBB | 272 | | | 3% | 81% | 1% | | | | 5% | 9% |
| BB | 69 | | | | 15% | 74% | | | 2% | | 8% |
| B | 37 | | | | | 3% | 70% | 3% | | | 23% |
| CCC | 12 | | | | | | 6% | 53% | 14% | 7% | 21% |
| Total | 1656 | | | | | | | | | | |

Source: Pacific Credit Ratings (2017)

**PCR Aggregate - 10-Year Transition and Default Rates**
(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Total Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 447 | 79% | | | | | | | | 5% | 16% |
| AA | 1667 | 1% | 84% | 1% | | | | | | 3% | 10% |
| A | 1187 | | 2% | 84% | 1% | | | | | 4% | 9% |
| BBB | 699 | | | 3% | 77% | 2% | | | | 4% | 14% |
| BB | 182 | | | | 11% | 58% | 1% | | 2% | | 27% |
| B | 87 | | | 2% | | 3% | 48% | 3% | | | 43% |
| CCC | 37 | | | | | | 4% | 62% | 10% | 5% | 20% |
| Total | 4306 | | | | | | | | | | |

Source: Pacific Credit Ratings (2017)

[7] The transition matrix was developed using the cohort method (see annex 1) with quarterly transition information. The 4th powered were used to annualize the matrices.

Then, our study of credit migration matrix in 2017 reflects that financial institutions, broker and dealers[8] with the highest ratings ("AAA", "AA" and "A") comprised 68% of the number of ratings outstanding. The 70% and 92% which began with an "AAA" and "AA" ratings, kept it during 2017, respectively. While 5% that started with "A" got an upgrade to "AA".

From the total of all insurance companies[9], those that began the year 2017 with an "AAA", "AA" and "A" rating has not seen variation. On the other hand, the "BBB", 8% received an increase in their rating to "A", while the remaining 66% kept stable and 33% has been withdrawn.

The issuer and issues of corporate companies[10] showed around 81%, 87% and 92% of them maintained an "AAA", "AA" and "A" ratings throughout the year 2017, respectively. The 1% of those rated "AA" at the beginning of the year received a downgrade to "A", the 8% of those rated "BBB" got an upgrade to "A" and the 9% fell to "BB". What is more, the 13% of the rated "CCC" kept it during 2017 and 44% received at default.

Asset-backed securities[11] and issues of government entities[12] maintained the same ratings throughout the year.

Overall, it is relevant to remark that companies rated by PCR keep on credit quality stable for the year 2017. PCR will stay watching closely credit risk by the study of transition/default matrix.

[8] See Annex 4
[9] See Annex 4
[10] See Annex 4
[11] See Annex 4
[12] See Annex 4

## 3. Bibliography and References


- International Monetary Fund, World Economic Outlook Update - January 16, 2018
- CEPAL, Date base and Statistical Publications.
- PCR: Credit Transition Matrices – December 2016
- Standard & Poor's: Default, Transition, and Recovery - 2018 Annual Global Corporate Default Study and Rating Transitions
- PCR Transition rating matrix (cohort method) model – Excel 2017
- RISKO http://www.risk-o.com/
- Risk Classifications:

http://www.ratingspcr.com/uploads/2/5/8/5/25856651/pcr-met-p-500_2017.pdf

## 4. Annex

### Annex 1: Estimation methodology

Credit transition matrices (also referred to as "credit migration matrices") are a key tool for the analysis of credit risk. In the regulatory field, the new Basel agreement requires capital estimations in accordance with rating migration behavior. Concerning investments, these matrices enable the comparison and forecast of the level of exposure to losses caused by default and devaluation due to credit spread movements. Consequently, they are cardinal inputs for financial applications such as portfolio risk management or the valuation of bonds and derivatives.

In simple terms, a credit transition matrix is comprised of "k" credit categories (ratings or notches) of which "k-2" are in a non-default state, one of them is in a default state and one of state of lack of information ("NR" or "Not Rated"). When the credit worthiness of the debtor changes, the rating agency can raise or lower rating ("upgrade" or "downgrade", respectively). The transition matrix reflects the probability that a security or classified company in a base category might migrate to another category of risk within a specific period; this is called the "transition interval." In general, the base category (also called time "T") is denoted vertically in the headings in the first column, while the target category (also called time "T + 1") is denoted horizontally by the headings on the first row.

An example of the transition matrix is shown below:

**PCR Aggregate - 1-Year Transition and Default Rates**
(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Total Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 137 | 71% | | | | | | | | 16% | 13% |
| AA | 568 | | 78% | 1% | | | | | | 10% | 11% |
| A | 419 | | 1% | 83% | | | | | | 11% | 5% |
| BBB | 232 | | | 5% | 70% | 2% | | | | 9% | 14% |
| BB | 60 | | | 0.7% | 24% | 61% | | | 6% | 1% | 7% |
| B | 31 | | | | 1% | 9% | 67% | | | | 23% |
| CCC | 12 | | | | | | | 26% | 18% | 18% | 37% |
| Total | 1459 | | | | | | | | | | |

Source: Pacific Credit Ratings (2017)

As you can see, stable ratings (the contents situated in the main diagonal of the matrix) capture the greatest probability of occurrence in most of cases. Empty cells represent a probability of zero, and some values have been removed from the matrix for clarity.

**The Cohort Method (frequency method)**

This approach assumes that time is divided into discrete intervals, within which one or more rating change events may occur. The cohort method only compares the situation of securities or companies rated at the beginning and at the end of each period, also called the "transition period". Each measurement point is commonly known as a "snapshot". Take for example, the case of a year divided into quarterly snapshots:

Figure 1

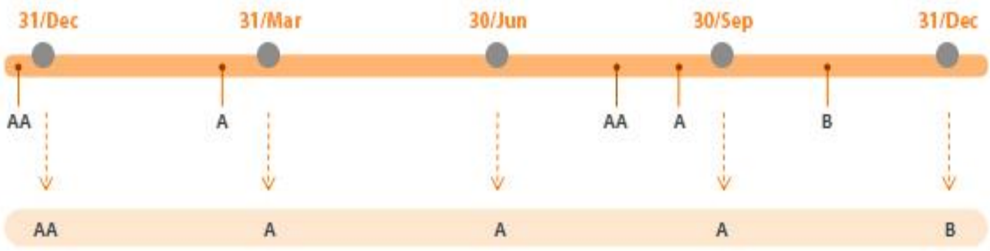
Cohort Method – Raw Data


Source: RISKO

The example shows the evolution of risk categories for a security that begins the year as "AA" and ends it as "B". During the year, the security underwent four rating transitions. From the point of view of the cohort method, risk categories should be considered only on key dates at the end of each quarter. Thus, the snapshots would show the following:

Figure 2

Cohort Method – Snapshots




Source: RISKO

As you can see, assessing the situation of the securities at the end of each quarter only allows two transitions to be considered. The reason is that when the second transition occurs, the rating returns to its original level, (i.e. A, AA, and again A), therefore, this method does not consider what may happen between snapshots. It should be noted that, if the transition period had been taken equal to a year, it would have only posted one transition from AA to B (i.e., the categories at the ends).

Formally, the transition matrix is calculated as follows with the cohort method. Given Ni(t) securities or companies classified with a rating category "i" at the beginning of each period of transition "t", provided that Nij(t) as the number of securities or companies that have migrated to the category of "j" by the end of the transition period.

Then, the estimated probability of transition for period "t" is:

$$P_{ij}(t) = \frac{N_{ij}(t)}{N_i(t)}, j \neq i$$

The cohort method is the procedure followed by Standard & Poor's to build their credit transition matrices, which PCR takes as a source. Since it is considered the industry standard, this will be the method of choice for the following analysis. However, given the problems when using a long period between snapshots, quarterly snapshots were taken (and the resulting matrices were annualized using a fourth matrix power).

**Annex 2: Rating scales**

As part of the process, we identified the following nine specific rating scales employed by PCR. It noted that as part of the PCR methodology, some ratings could be qualified (accompanied by signs "+" or "-"). In addition, each scale contains a notch corresponding to withdrawn other (NR).

Table 1: Specific rating scales assumed for the analysis

| N° | Scale | Notches | Code |
|---|---|---|---|
| 1 | Short-term corporate debt issues | 8 | CP |
| 2 | Short-term deposits at financial system entities | 6 | CPF |
| 3 | Medium and long-term deposits at financial system entities | 19 | DSF |
| 4 | Medium- and long-term corporate debt issues and preferred shares | 20 | LP |
| 5 | Common shares | 6 | AC |
| 6 | Mutual funds | 18 | FM |
| 7 | Insurance companies debt (CPA) | 19 | CPA |
| 8 | Financial Strength of Banks and insurance companies | 23 | FF |
| 9 | Securitizations (Asset back securities) | 22 | TI |

Source: PCR

An exercise of unification of the ratings scales between countries was conducted, so that the statistics could be compatible and integrated into the desired transition and default matrix.

The qualified notches used on each scale presented below.

- Short-term corporate debt issues: 1+; 1; 1-; 2; 3; 4; 5; NR
- Short-term deposits at financial system entities: I; II; III; IV; V; NR
- Medium and long-term deposits at financial system entities: AAA; AA+; AA; AA-; A+; A; A-; BBB+; BBB; BBB-; BB+; BB; BB-; B+; B; B-; CCC; DD; NR
- Medium- and long-term corporate debt issues and preferred shares: AAA; AA+; AA; AA-; A+; A; A-; BBB+; BBB; BBB-; BB+; BB; BB-; B+; B; B-; CCC; DD; D; NR
- Common shares: N1; N2; N3; N4; N5; NR
- Mutual funds: AAAf; AAf+; AAf; AAf-; Af+; Af; Af-; BBBf+; BBBf; BBBf-; BBf+; BBf; BBf-; Bf+; Bf; Bf-; CCCf; NR
- Insurance companies debt (CPA): AAA; AA+; AA; AA-; A+; A; A-; BBB+; BBB; BBB-; BB+; BB; BB-; B+; B; B-; CCC; DD; NR
- Financial Strength of Banks and insurance companies: AAA; AA+; AA; AA-; A+; A; A-; BBB+; BBB; BBB-; BB+; BB; BB-; B+; B; B-; CCC; C+; C; DD; D; E; NR
- Securitizations (Asset back securities): AAA; AA+; AA; AA-; A+; A; A-; BBB+; BBB; BBB-; BB+; BB; BB-; B+; B; B-; CCC; C; DD; D; NR

**Rating scale and specific matrices assumed for the analysis**

The following unified scale used for transition matrix: AAA, AA, A, BBB, BB, B, CCC, C, DD and NR.

Five specific transition and default matrix produced for the following types of issuers or securities (see annex 3):

1. Financial Institutions, brokers and dealers
2. Insurance Companies
3. Corporate debt Issues of medium and long-term debt and Preferred Stock
4. Sovereign Issuers
5. Asset Backed Securities

**Annex 3: Other assumptions and methodological aspects**

**a) The treatment of the Default case (D)**

In all the ratings scales, there are three special categories: the "D", "paid off" and withdrawn other rating.

The condition of classifies obligors, securities, or money market instruments as being in "Default" is when the company has lost its capacity to accomplish with its contractual obligations. A rating is considered as "Paid Off" if the issuer of the security or money market instrument assigned the rating extinguished its obligation with respect to the security or money market instrument during the applicable time period by paying in full all outstanding principal and interest due according to the terms of the security or money market instrument, either because the security was due, was required or was prepaid and withdrawn other standing for other reasons when the company or the security of the issuer withdrawn the ratings for other different reasons than enters into default or paid off. The final form of the matrix depends on the ways in which these categories are processed as part of the analysis.

These are informational values, because it allows the identification of the proportion of securities or companies that migrated to these conditions.

**b) Point estimate (point-in-time) versus estimation through the cycle (through-the-cycle)**

In the estimation of a transition matrix, one can usually distinguish two kinds of procedures according to the size of the data sample used.

If the sample only corresponds to the most recent observations, then it is categorized as a point estimate (point-in-time). This kind of statistical measure is not affected by prior events but is strongly affected by the short-term trends. In other words, does not allow for capturing of the value of medium-term trends of transition probabilities. If the estimation is done with a wide sample, covering a series of stages of the economic cycle, it qualifies as an estimate done through the cycle (through-the-cycle).

Four different samples will be used as part of this project, one point-in-time and three through-the-cycles:

- Two one-year samples (2017 and 2015)
- A three-years sample ending in 2017 (2014-2017)
- A ten-years sample ending in 2017 (2007-2017)
- The whole database sample (spanning 26 years from 1990 to 2017)

**c) Ratings mapping for the Financial Strength of Banks and Insurance Companies in Peru**

The following mapping procedure was used for the historical ratings of the financial strength of banks and insurance companies in Peru.

Table 2: Ratings Mapping Financial Strength of Banks and Insurance Companies in Peru

| N° | Original rating | Equivalent rating |
|---|---|---|
| 1 | A+ | AAA |
| 2 | A | AA |
| 3 | A- | A |
| 4 | B | BBB |
| 5 | C | BB |
| 6 | D | B |
| 7 | E | C |
| 8 | E | D |
| 9 | E | E |

Source: PCR

**d) Other assumptions and adjustments**

In addition to the procedures, the following assumptions and adjustments were adopted:

1. Country prefixes were removed from ratings.
2. Rating outlooks were not considered.
3. For those rating dates which were given as intervals (e.g. "first half of 2001"), the median date for the time interval was assumed.
4. Rating cancellation dates posterior to the maturity of the security were adjusted.
5. For securities which had an ending date ("termination of classification"), it was assumed that a transition to the "NR" rating occurred on that date.

## Annex 4: Transition/default matrices

### a) For one year (2017)

**Financial Institutions, Brokers and Dealers -1 Year Transition and Default Rates**

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 59 | **70%** | | | | | | | | | **30%** |
| AA | 201 | | **92%** | | | | | | | | **8%** |
| A | 159 | | **5%** | **90%** | | | | | | | **5%** |
| BBB | 123 | | | **6%** | **88%** | | | | | | **6%** |
| BB | 39 | | | | **17%** | **73%** | | | | | **10%** |
| B | 27 | | | | | | **74%** | | | | **26%** |
| CCC | 7 | | | | | | | **54%** | | | **46%** |
| Total | 615 | | | | | | | | | | |

## Insurance companies -1 Year Transition and Default Rates

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 11 | **100%** | | | | | | | | | |
| AA | 42 | | **67%** | | | | | | | | **33%** |
| A | 77 | | | **95%** | | | | | | | **5%** |
| BBB | 41 | | | **8%** | **66%** | | | | | | **25%** |
| BB | 1 | | | | **100%** | 0% | | | | | |
| B | 3 | | | | | | **100%** | | | | |
| CCC | 0 | | | | | | | | | | |
| Total | 175 | | | | | | | | | | |

## Corporate Issues* - 1 Year Transition and Default Rates

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 58 | **81%** | | | | | | | | | **19%** |
| AA | 303 | | **87%** | **1%** | | | | | | | **11%** |
| A | 153 | | | **92%** | | | | | | | **8%** |
| BBB | 36 | | | **8%** | **48%** | **9%** | | | | | **35%** |
| BB | 2 | | | | | **100%** | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 5 | | | | | | | **13%** | **44%** | | **44%** |
| Total | 557 | | | | | | | | | | |

*The corporate rating category include debt issuances of medium and long term debt and preferred stock.

## Asset-Backed Securities -1 Year Transition and Default Rates

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 157 | **84%** | | | | | | | | **5%** | **11%** |
| AA | 95 | | **59%** | | | | | | | **28%** | **14%** |
| A | 103 | | | **75%** | | | | | | **25%** | |
| BBB | 18 | | | | **80%** | | | | | **20%** | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 2 | | | | | | | **6%** | | **94%** | |
| Total | 375 | | | | | | | | | | |

## Public Finance -1 Year Transition and Default Rates

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 2 | **100%** | | | | | | | | | |
| AA | 6 | | **100%** | | | | | | | | |
| A | 22 | | | **83%** | | | | | | | **17%** |
| BBB | 27 | | | | **76%** | **11%** | | | **0%** | | **13%** |
| BB | 18 | | | | **32%** | **62%** | | | **4%** | | **2%** |
| B | 1 | | | | **26%** | **68%** | 0% | | **4%** | | **1%** |
| CCC | 0 | | | | | | | | | | |
| Total | 76 | | | | | | | | | | |

**b) For three years (2015-2017)**

## Financial Institutions, Brokers and Dealers -3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 170 | **89%** | | | | | | | | | **11%** |
| AA | 560 | **3%** | **90%** | | | | | | | | **7%** |
| A | 446 | | **4%** | **90%** | | | **1%** | | | | **5%** |
| BBB | 361 | | **1%** | **5%** | **85%** | **1%** | | | | | **7%** |
| BB | 118 | | | | **12%** | **78%** | | | | | **10%** |
| B | 78 | | | | | | **86%** | **4%** | | | **10%** |
| CCC | 30 | | | | | | **10%** | **57%** | **11%** | | **22%** |
| Total | 1763 | | | | | | | | | | |

## Insurance companies -3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 28 | **100%** | | | | | | | | | |
| AA | 121 | | **82%** | **3%** | | | | | | | **15%** |
| A | 244 | | | **98%** | | | | | | | **2%** |
| BBB | 126 | | | **3%** | **88%** | | | | | | **9%** |
| BB | 3 | | | | **33%** | **67%** | | | | | |
| B | 5 | | | | | | **100%** | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 527 | | | | | | | | | | |

## Corporate Issues* - 3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 232 | **82%** | | | | | | | | | **18%** |
| AA | 959 | | **92%** | **1%** | | | | | | | **7%** |
| A | 433 | | | **95%** | | **1%** | | | | | **5%** |
| BBB | 99 | | | **4%** | **72%** | **3%** | | | | | **22%** |
| BB | 9 | | | **0.5%** | **27%** | **37%** | | | | | **35%** |
| B | 0 | | | | | | 0% | | | | |
| CCC | 7 | | | | | | | **26%** | **37%** | | **37%** |
| Total | 1739 | | | | | | | | | | |

*The corporate rating category include debt issuances of medium and long term debt and preferred stock.

## Asset-Backed Securities -3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 503 | **80%** | | | | | | | | **2%** | **18%** |
| AA | 320 | | **84%** | | | | | | | **11%** | **5%** |
| A | 248 | | | **82%** | **4%** | | | | | **13%** | **2%** |
| BBB | 46 | | | | **63%** | | | | | **37%** | |
| BB | 0 | | | | | 0% | | | | | |
| B | 5 | | | | | | **6%** | | | | **94%** |
| CCC | 10 | | | | | | | **66%** | | **34%** | |
| Total | 1132 | | | | | | | | | | |

## Public Finance -3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 10 | **100%** | | | | | | | | | |
| AA | 8 | | **100%** | | | | | | | | |
| A | 54 | | | **93%** | | | | | | | **7%** |
| BBB | 108 | | | | **90%** | **3%** | | | | | **7%** |
| BB | 52 | | | | **14%** | **79%** | | | **7%** | | |
| B | 4 | | | | **5%** | **61%** | **32%** | | **2%** | | |
| CCC | 0 | | | | | | | | | | |
| Total | 236 | | | | | | | | | | |

c) **For ten years (2008-2017)**

## Financial Institutions, Brokers and Dealers -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 270 | **86%** | | | | | | | | | **14%** |
| AA | 785 | **2%** | **83%** | **2%** | | | | | | | **13%** |
| A | 704 | | **4%** | **83%** | | | **1%** | | | | **12%** |
| BBB | 495 | | **1%** | **5%** | **79%** | **1%** | | | | | **14%** |
| BB | 206 | | | | **10%** | **55%** | **1%** | | | | **34%** |
| B | 120 | | | | | **2%** | **68%** | **5%** | | | **24%** |
| CCC | 41 | | | | | | **7%** | **67%** | **8%** | | **18%** |
| Total | 2621 | | | | | | | | | | |

## Insurance companies -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 36 | **89%** | | | | | | | | | **11%** |
| AA | 185 | | **86%** | **2%** | | | | | | | **12%** |
| A | 393 | | **2%** | **96%** | | | | | | | **2%** |
| BBB | 154 | | | **2%** | **88%** | | | | | | **10%** |
| BB | 3 | | | **1%** | **75%** | **20%** | | | | | **4%** |
| B | 10 | | | **34%** | | | **66%** | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 781 | | | | | | | | | | |

## Corporate Issues* - 10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 405 | **79%** | | | | | | | | | **21%** |
| AA | 1409 | | **90%** | **1%** | | | | | | | **9%** |
| A | 529 | | **1%** | **93%** | | **1%** | | | | | **6%** |
| BBB | 132 | | | **3%** | **76%** | **2%** | | | | | **19%** |
| BB | 16 | | | | **18%** | **59%** | | | | | **22%** |
| B | 0 | | | | | | 0% | | | | |
| CCC | 9 | | | | | | | **20%** | **27%** | | **53%** |
| Total | 2500 | | | | | | | | | | |

*The corporate rating category include debt issuances of medium and long term debt and preferred stock.

## Asset-Backed Securities -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 742 | **80%** | | | | | | | | **1%** | **18%** |
| AA | 446 | | **85%** | | | | | | | **8%** | **8%** |
| A | 320 | | **1%** | **83%** | **4%** | | | | | **11%** | **1%** |
| BBB | 49 | | | | **65%** | | | | | **35%** | |
| BB | 0 | | | | | 0% | | | | | |
| B | 12 | | | | | | **6%** | | | | **94%** |
| CCC | 20 | | | | | | | **81%** | | **19%** | |
| Total | 1589 | | | | | | | | | | |

## Sovereign issuers -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 0 | 0% | | | | | | | | | |
| AA | 0 | | 0% | | | | | | | | |
| A | 0 | | | 0% | | | | | | | |
| BBB | 8 | | | | 0% | | | | | | **100%** |
| BB | 2 | | | | | **6%** | | | | | **94%** |
| B | 3 | | | | | | **1%** | | | | **99%** |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 13 | | | | | | | | | | |

## Public Finance -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 15 | **100%** | | | | | | | | | |
| AA | 8 | | **100%** | | | | | | | | |
| A | 65 | | | **94%** | | | | | | | **6%** |
| BBB | 126 | | | | **88%** | **5%** | | | | | **6%** |
| BB | 64 | | | | **11%** | **78%** | | | **11%** | | |
| B | 4 | | | | **4%** | **61%** | **32%** | | **4%** | | |
| CCC | 0 | | | | | | | | | | |
| Total | 282 | | | | | | | | | | |

## Annex 5: Transition/default matrices (Asset-Backed Securities)

a) **For one year (2017)**

### Asset-Backed Securities (Residential morgage backed securities) -1 Year Transition and Default Rates

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 11 | **100%** | | | | | | | | | |
| AA | 2 | | **100%** | | | | | | | | |
| A | 3 | | | **100%** | | | | | | | |
| BBB | 0 | | | | 0% | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 16 | | | | | | | | | | |

## Asset-Backed Securities (Collateralized loan obligation) -1 Year Transition and Default Rates

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 3 | **100%** | | | | | | | | | |
| AA | 0 | | 0% | | | | | | | | |
| A | 0 | | | 0% | | | | | | | |
| BBB | 0 | | | | 0% | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 3 | | | | | | | | | | |

## Asset-Backed Securities (Collateralized debt obligation) -1 Year Transition and Default Rates

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 20 | **81%** | | | | | | | | | **19%** |
| AA | 0 | | 0% | | | | | | | | |
| A | 0 | | | 0% | | | | | | | |
| BBB | 6 | | | | **100%** | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 26 | | | | | | | | | | |

## Asset-Backed Securities (Other structured finance products) -1 Year Transition and Default Rates

(December 31, 2016 through December 31, 2017)

| Credit Ratings as of 12/31/2016 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2016-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 114 | **75%** | | | | | | | | **19%** | **6%** |
| AA | 93 | | **80%** | **4%** | | | | | | **8%** | **8%** |
| A | 97 | | | **74%** | | | | | | **26%** | |
| BBB | 12 | | | | **71%** | | | | | **29%** | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 2 | | | | | | | **6%** | | **94%** | |
| Total | 318 | | | | | | | | | | |

**b) For three years (2015-2017)**

## Asset-Backed Securities (Residential morgage backed securities) -3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 27 | **54%** | | | | | | | | | **46%** |
| AA | 4 | | **6%** | | | | | | | | **94%** |
| A | 12 | | | **18%** | | | | | | | **82%** |
| BBB | 0 | | | | 0% | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 5 | | | | | | 0% | | | | **100%** |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 48 | | | | | | | | | | |

## Asset-Backed Securities (Collateralized loan obligation) -3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 5 | **100%** | | | | | | | | | |
| AA | 0 | | 0% | | | | | | | | |
| A | 0 | | | 0% | | | | | | | |
| BBB | 0 | | | | 0% | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 5 | | | | | | | | | | |

## Asset-Backed Securities (Collateralized debt obligation) -3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 68 | **94%** | | | | | | | | | **6%** |
| AA | 0 | | 0% | | | | | | | | |
| A | 0 | | | 0% | | | | | | | |
| BBB | 22 | | | | **100%** | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 90 | | | | | | | | | | |

## Asset-Backed Securities (Other structured finance products) -3 Years Transition and Default Rates

(December 31, 2014 through December 31, 2017)

| Credit Ratings as of 12/31/2014 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2014-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 388 | **83%** | | | | | | | | **11%** | **7%** |
| AA | 316 | | **93%** | **1%** | | | | | | **4%** | **2%** |
| A | 231 | | | **82%** | **3%** | | | | | **14%** | |
| BBB | 24 | | | | **39%** | | | | | **61%** | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 10 | | | | | | | **66%** | | **34%** | |
| Total | 969 | | | | | | | | | | |

c) For ten years (2008-2017)

## Asset-Backed Securities (Residential morgage backed securities) -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 44 | **17%** | | | | | | | | | **83%** |
| AA | 14 | | 0% | | | | | | | | **100%** |
| A | 20 | | | **5%** | | | | | | | **95%** |
| BBB | 0 | | | | 0% | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 12 | | | | | | 0% | | | | **100%** |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 90 | | | | | | | | | | |

## Asset-Backed Securities (Collateralized loan obligation) -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 5 | **100%** | | | | | | | | | |
| AA | 0 | | 0% | | | | | | | | |
| A | 0 | | | 0% | | | | | | | |
| BBB | 0 | | | | 0% | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 5 | | | | | | | | | | |

## Asset-Backed Securities (Collateralized debt obligation) -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 82 | **100%** | | | | | | | | | |
| AA | 0 | | 0% | | | | | | | | |
| A | 24 | | | **100%** | | | | | | | |
| BBB | 0 | | | | **100%** | | | | | | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 0 | | | | | | | 0% | | | |
| Total | 106 | | | | | | | | | | |

## Asset-Backed Securities (Other structured finance products) -10 Years Transition and Default Rates

(December 31, 2007 through December 31, 2017)

| Credit Ratings as of 12/31/2007 | | Credit Ratings as of 12/31/2017 (Percent) | | | | | | | Other Outcomes During 12/31/2007-12/31/2017 (Percent) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit Rating | Number of Ratings Outstanding | AAA | AA | A | BBB | BB | B | CCC | Default | Paid off | Withdrawn (other) |
| AAA | 596 | **85%** | | | | | | | | **8%** | **6%** |
| AA | 432 | | **95%** | **1%** | | | | | | **3%** | **2%** |
| A | 295 | | **1%** | **84%** | **4%** | | | | | **12%** | |
| BBB | 25 | | | | **41%** | | | | | **59%** | |
| BB | 0 | | | | | 0% | | | | | |
| B | 0 | | | | | | 0% | | | | |
| CCC | 10 | | | | | | | **81%** | | **19%** | |
| Total | 1358 | | | | | | | | | | |