

Default, Transition, and Recovery:

# 2017 Annual Taiwan Ratings Corp. Corporate Default Study And Rating Transitions

May 25, 2018

(Editor's Note: This study examines ratings assigned by Taiwan Ratings Corp., a partner of S&P Global Ratings. Taiwan Ratings issues rating symbols accompanied by a "tw" prefix to denote Taiwan and the rating scale's focus on Taiwanese financial markets.)

For corporate entities and financial services companies rated by Taiwan Ratings Corp. (TRC), ratings volatility was notably low in 2017. Ratings stability (as measured by the proportion of ratings that remained the same from the start of the year to the end of the year) was 88%, compared with a historical weighted average of 76%. This stability largely stemmed from the fact that there were no defaults or downgrades in 2017.

This default and rating transition study closely examines the track record of the 305 corporate issuer credit ratings that TRC has assigned since operations began in 1998. We primarily measure ratings migration over time and provide quantitative measures of ratings distribution and movement. Ratings covered in this study are those on Taiwan-based obligors in the nonfinancial, utility, insurance, and financial services sectors. These include public and confidentially rated entities, as well as those with ratings that were later withdrawn. The negative relationship between higher ratings and both ratings volatility and default frequency is consistent with that observed in other S&P Global Fixed Income Research default studies.

## Overview

- Ratings stability--as measured by the percentage of issuers with the same ratings at the end of the year as at the beginning--fell slightly in 2017, to 88.3% from 88.7% in 2016.
- There were no defaults or downgrades. The proportion of upgrades increased to 6.6% in 2017 from 6% in 2016.
- Taiwan Ratings Corp.'s ratings continue to show a clear correspondence between rating and default remoteness, with default rates among investment-grade ratings well below those of speculative-grade ratings across all time frames. This finding is also consistent with the performance of S&P Global Ratings' global scale ratings.

The default risks for S&P Global Ratings' global scale ratings and ratings on TRC's scale, which is a national scale, differ. National scale credit ratings are calibrated to better distinguish the relative credit risk within a country. (S&P Global Ratings has assigned the government of Taiwan 'AA-/A-1+' unsolicited issuer credit ratings with a stable outlook.) Because of the differences in the two rating scales, we do not make any direct comparisons between S&P Global Ratings' and TRC's ratings in this report. However, as a general rule, both rating scales display the same principle: Higher ratings exhibit lower default rates and greater stability than lower ratings.

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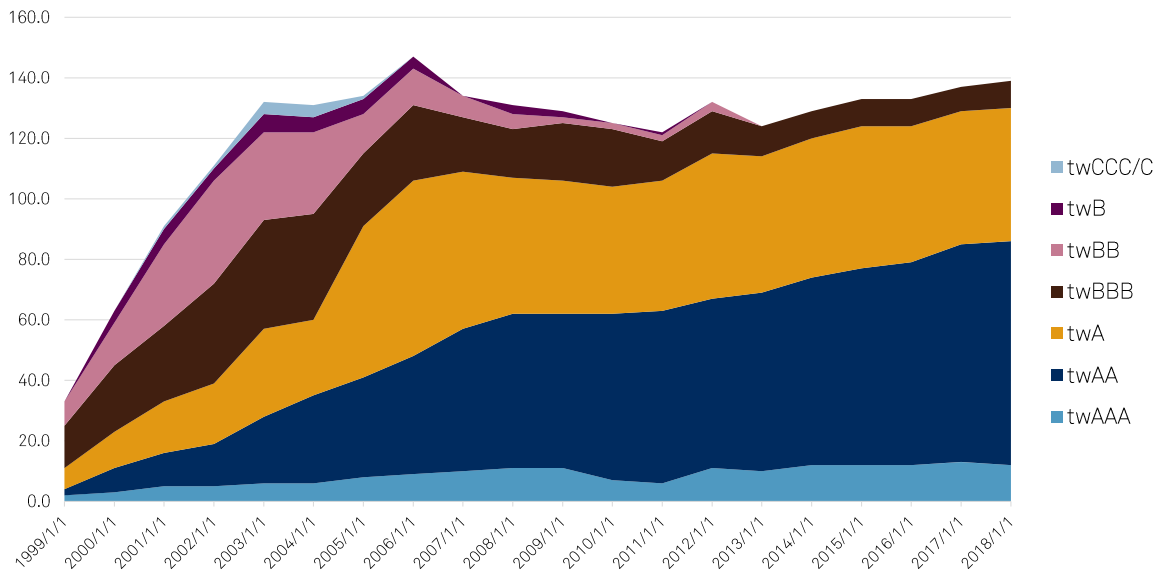
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The Taiwanese economy grew by 2.9% in 2017, double the growth rate from 2016 and much higher than the low rate of 0.8% for 2015. S&P Global economists predict that the economy will grow between 2.5% and 2.7% in each year from 2018-2020. The unemployment rate was 3.8% at the end of 2017, and S&P Global economists believe that it will gradually decline to 3.1% by the end of 2020. These strong underpinnings should provide a foundation for continued credit strength moving forward.

The number of ratings on Taiwan corporate and financial services companies (including insurance companies) has been small but significant over time, starting in 1999 with 33 active ratings and increasing to 139 by the start of 2018. Historically, Taiwan corporate ratings have been heavily skewed toward investment grade ('twBBB-' or higher), and this trend has only been increasing over time (see chart 1). In fact, all Taiwan corporate and financial services ratings were investment grade at the start of 2018, marking the sixth year in a row to start with all investment-grade ratings. Speculative-grade ratings in Taiwan ('twBB+' or lower) have been steadily decreasing as a proportion of total ratings since peaking at 36% at the start of 2001.

Chart 1

### Taiwan National Scale Corporate Rating Distribution



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## No Downgrades In 2017

To analyze rating actions during the year, we look at ratings at the start of the year and at the end of the year. During 2017, there were nine upgrades and no downgrades (see table 1). This was the first time since 1999 that there were no downgrades among Taiwan ratings. However, there were seven ratings withdrawn during the year, though none of them was lowered prior to withdrawal. Ratings stability fell very slightly in 2017, to 88.3% from 88.7% in 2016. In general, higher ratings tend to be more stable than lower ratings, and Taiwan ratings have been exclusively investment grade for five full consecutive years.

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Table 1

### Summary Of Annual Ratings Changes In Taiwan, 1999-2017

Year	Issuer count as of Jan. 1	Upgrades (%)	Downgrades (%)*	Defaults (%)	Withdrawn ratings (%)	Unchanged ratings (%)	Changed ratings (%)	Downgrade/upgrade ratio
1999	33	9.09	0.00	0.00	0.00	90.91	9.09	0.00
2000	63	3.17	12.70	1.59	3.17	79.37	20.63	4.01
2001	91	2.20	10.99	0.00	3.30	83.52	16.49	5.00
2002	111	17.12	18.02	0.00	12.61	52.25	47.75	1.05
2003	132	15.15	3.79	0.00	13.64	67.42	32.58	0.25
2004	131	57.25	2.29	0.00	9.16	31.30	68.70	0.04
2005	134	13.43	0.75	0.75	5.22	79.85	20.15	0.06
2006	147	15.65	2.72	0.68	17.01	63.95	36.06	0.17
2007	134	17.91	4.48	3.73	6.72	67.16	32.84	0.25
2008	131	4.58	5.34	1.53	5.34	83.21	16.79	1.17
2009	129	0.78	16.28	0.00	9.30	73.64	26.36	20.87
2010	125	4.80	3.20	0.00	7.20	84.80	15.20	0.67
2011	122	12.30	5.74	0.00	2.46	79.51	20.50	0.47
2012	132	3.03	3.03	0.00	11.36	82.58	17.42	1.00
2013	124	6.45	3.23	0.00	4.03	86.29	13.71	0.50
2014	129	3.10	1.55	0.00	3.88	91.47	8.53	0.50
2015	133	6.02	3.76	0.00	3.76	86.47	13.54	0.62
2016	133	6.02	3.01	0.75	1.50	88.72	11.28	0.50
2017	137	6.57	0.00	0.00	5.11	88.32	11.68	0.00
Weighted average (1999-2017)		11.23	5.06	0.48	7.05	76.18	23.82	0.45

Note: Rating changes measured from the rating as of Jan. 1 to the rating as of Dec. 31 and exclude all intermediate rating changes. \*Excludes downgrades to 'D' (default), shown separately in the defaults column. Source: S&P Global Fixed Income Research. Copyright © by Taiwan Ratings Corp. All rights reserved.

Of the nine upgrades in 2017, four were for companies under **Mega Financial Holding Co. Ltd.**, an umbrella organization for several major Taiwanese banks and insurers. In total, seven upgrades were among financial or insurance companies, while two were from corporates. All upgrades were movements of one notch, with three ratings moving to 'twAA-' from 'twA+', one moving to 'twA-' from 'twBBB+' (this rating was withdrawn later in the year), and the rest moving within the 'twAA' category (see table 2).

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Table 2

### One-Year Transitions

(Count)

From/To	Total	twAAA	twAA+	twAA	twAA-	twA+	twA	twA-	twBBB+	twBBB	twBBB-	twBB+	twBB	twBB-	twB+	twB	twB-	twCCC/C	D	NR	
twAAA	13	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
twAA+	21	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
twAA	19	0	1	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twAA-	32	0	0	5	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
twA+	20	0	0	0	3	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twA	18	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twA-	6	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
twBBB+	6	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	2
twBBB	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
twBBB-	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
twBB+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twBB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twBB-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twB+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twB-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
twCCC/C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

D--Default. NR--Not rated. Source: S&P Global Fixed Income Research. Copyright © by Taiwan Ratings Corp. All rights reserved.

The number of new issuer ratings in Taiwan has generally been falling over time, but in 2017, eight new ratings were issued--a three-year high (see table 3). The issuers consisted of seven industrial firms and one finance company.

Table 3

### New Issuers By Sector

(Count)	Financial institutions	Industrials and utilities	Total
1998	31	2	33
1999	25	5	30
2000	26	5	31
2001	9	14	23
2002	28	11	39
2003	8	8	16
2004	6	9	15
2005	10	9	19
2006	6	8	14
2007	10	3	13
2008	7	2	9

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2009	2	3	5
2010	1	5	6
2011	4	4	8
2012	3	2	5
2013	7	1	8
2014	3	5	8
2015	2	3	5
2016	3	1	4
2017	1	7	8
Total	192	107	299
Percentage of total (%)	64.2	35.8	100.0

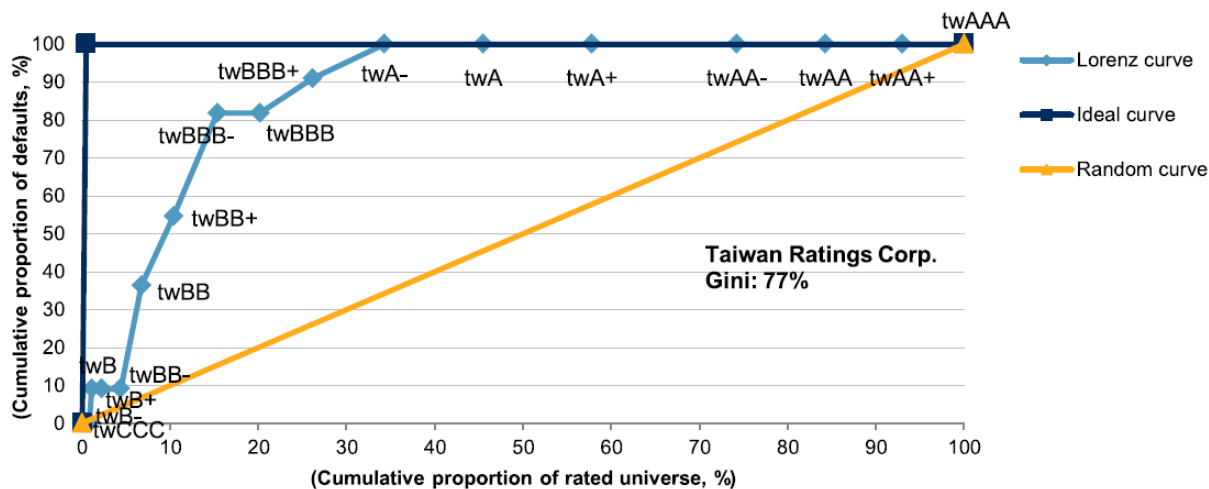
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## Lorenz Curves And Gini Coefficients

Gini ratios are measures of the rank-ordering power of ratings over a given time horizon. They are ratios of actual rank-ordering performance to theoretically perfect rank ordering. Over each time span, lower ratings correspond to higher default rates (see charts 2-4). For example, in the one-year Lorenz curve, 55% of defaults occurred in the speculative-grade category, while speculative-grade ratings constituted only 10% of all corporate ratings. If the rank ordering of ratings had little predictive value, the cumulative share of defaulting corporate entities and the cumulative share of all entities at each rating would be nearly the same, producing a Gini ratio of zero (see "Appendix II: Gini Methodology").

Chart 2

### Taiwan Corporate One-Year Lorenz Curve and Gini Coefficient



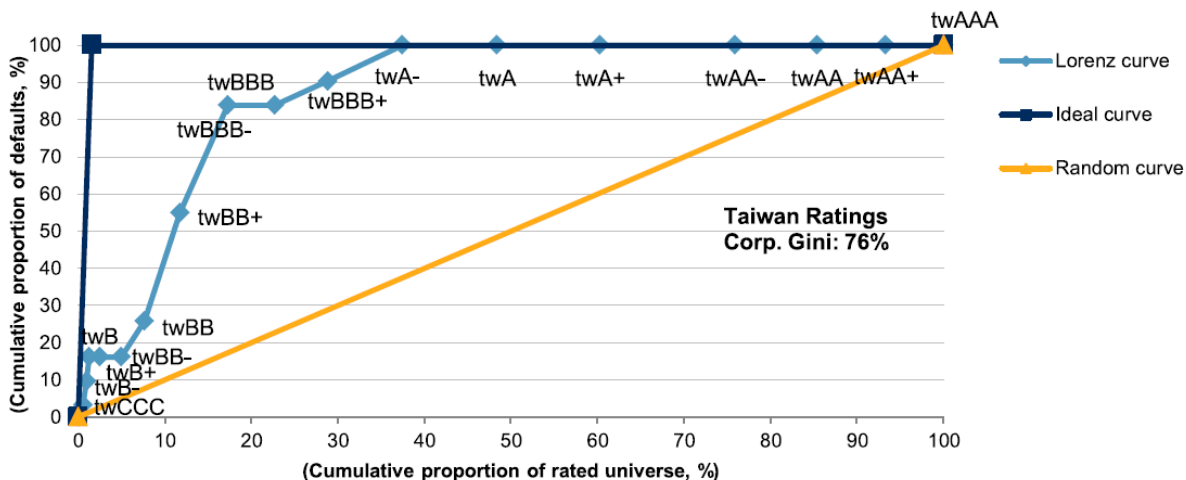
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Chart 3

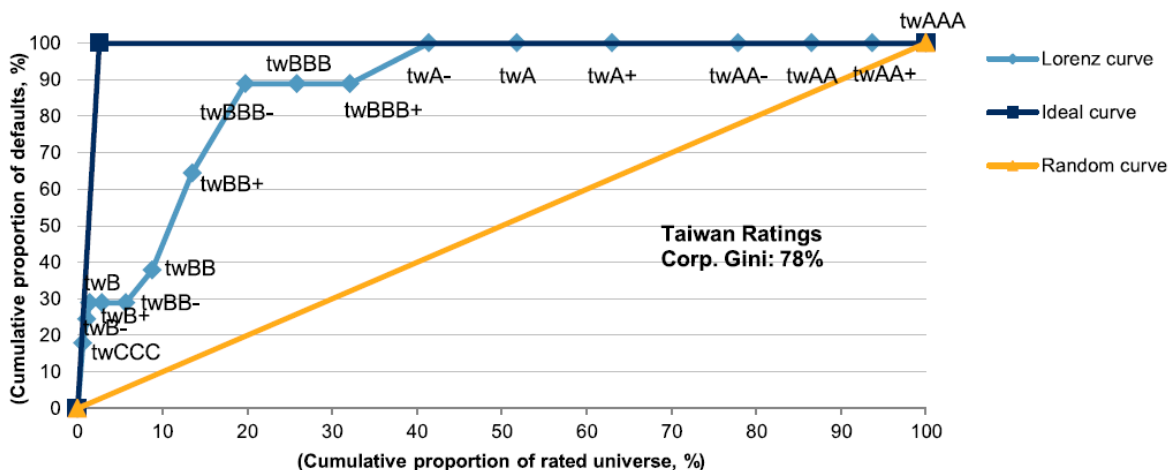
### Taiwan Corporate Three-Year Lorenz Curve And Gini Coefficient



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Chart 4

### Taiwan Corporate Five-Year Lorenz Curve And Gini Coefficient



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## Ratings And Cumulative Default Rates Remained Negatively Correlated

This study found that defaults and ratings are negatively correlated, consistent with all of S&P Global Fixed Income Research's default studies: The higher the rating, the lower the incidence of default. This relationship holds even for a smaller rated population, as is the case with Taiwan-based entities. One exception is the 'twCCC'/'twCC' category, for which we do not see any default activity until the three-year horizon, due to its very small data set. However, by year four, this category's default rate is well above that of the 'twB' category--in line with expectations.

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Table 4

### Taiwan Cumulative Average Default Rates (1999-2017)

(%)	--Time horizon (years)--									
	1	2	3	4	5	6	7	8	9	10
twAAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
twAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
twA	0.14	0.29	0.45	0.62	0.80	1.01	1.23	1.23	1.23	1.23
twBBB	1.12	2.55	3.42	4.02	4.02	4.34	5.01	5.71	6.46	6.46
twBB	2.70	4.86	6.49	7.03	8.65	10.27	11.92	13.04	13.60	13.60
twB	2.56	7.69	10.26	10.26	12.82	15.38	20.51	25.81	28.46	28.46
twCCC/C	0.00	0.00	9.09	45.45	72.73	90.91	100.00	N/A	N/A	N/A
Investment grade	0.25	0.56	0.79	0.97	1.04	1.18	1.42	1.60	1.80	1.80
Speculative grade	2.55	5.11	7.23	9.36	12.34	14.89	17.49	19.24	20.12	20.12
All rated	0.48	1.05	1.50	1.93	2.39	2.88	3.49	3.94	4.27	4.27

N/A--Not applicable. Source: S&P Global Fixed Income Research. Copyright © by Taiwan Ratings Corp. All rights reserved.

## Transition Matrices

Transition matrices show how ratings behave over time, including movements to other rating categories, movements to default, and rating withdrawals (see tables 5-8). The results presented here are consistent with other S&P Global Fixed Income Research default studies, in that there is a clear correspondence between higher ratings and lower default activity. This relationship holds over shorter and longer periods.

Ratings stability is also generally higher among investment-grade ratings than speculative-grade ratings. For example, over a one-year time frame, an average of 95% of 'twAA' rated issuers maintain this rating one year later, compared with 59% of 'twBB' rated issuers. This general relationship is also true over longer horizons. A key observation when analyzing transition matrices that present averages computed over multiple static pools is that the standard deviations associated with each transition point in the matrix are large relative to the averages (outside of stability rates).

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Table 5

### Average One-Year Transition Rates (1999-2017)

(%)

From/To	twAAA	twAA	twA	twBBB	twBB	twB	twCCC/CC	D	NR
twAAA	88.05	7.55	0.00	0.00	0.00	0.00	0.00	0.00	4.40
	(15.08)	(13.61)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(6.38)
twAA	1.50	94.88	1.00	0.00	0.00	0.00	0.00	0.00	2.63
	(2.11)	(3.51)	(1.31)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(2.39)
twA	0.00	6.12	87.62	1.81	0.14	0.00	0.00	0.14	4.17
	(0.00)	(6.54)	(7.34)	(3.11)	(0.52)	(0.00)	(0.00)	(0.55)	(4.13)
twBBB	0.00	0.28	9.22	75.70	1.40	0.00	0.00	1.12	12.29
	(0.00)	(1.10)	(20.89)	(22.85)	(2.00)	(0.00)	(0.00)	(3.22)	(10.92)
twBB	0.00	0.00	0.54	12.43	59.46	0.54	0.54	2.70	23.78
	(0.00)	(0.00)	(1.36)	(17.32)	(27.35)	(2.83)	(1.18)	(6.81)	(17.17)
twB	0.00	0.00	0.00	0.00	7.69	46.15	7.69	2.56	35.90
	(0.00)	(0.00)	(0.00)	(0.00)	(9.78)	(31.77)	(17.04)	(9.36)	(35.84)
twCCC/CC	0.00	0.00	0.00	0.00	36.36	0.00	63.64	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(45.17)	(0.00)	(45.17)	(0.00)	(0.00)

Note: Numbers in parentheses are weighted standard deviations, weighted by the issuer base. D--Default. NR--Not rated Source: S&P Global Fixed Income Research. Copyright © by Taiwan Ratings Corp. All rights reserved.

Table 6

### Average Three-Year Transition Rates (1999-2017)

(%)

From/To	twAAA	twAA	twA	twBBB	twBB	twB	twCCC/CC	D	NR
twAAA	70.15	18.66	0.00	0.00	0.00	0.00	0.00	0.00	11.19
	(21.11)	(21.78)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(8.80)
twAA	3.93	87.75	2.27	0.00	0.00	0.00	0.00	0.00	6.05
	(3.80)	(4.72)	(1.26)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(2.24)
twA	0.00	14.60	68.57	4.13	0.63	0.00	0.00	0.48	11.59
	(0.00)	(11.66)	(10.81)	(4.82)	(1.31)	(0.00)	(0.00)	(0.84)	(3.60)
twBBB	0.00	2.93	20.53	42.82	2.05	0.00	0.00	3.23	28.45
	(0.00)	(3.72)	(25.80)	(25.74)	(3.73)	(0.00)	(0.00)	(5.25)	(14.87)
twBB	0.00	0.00	5.41	23.78	18.38	0.00	1.08	6.49	44.86
	(0.00)	(0.00)	(7.91)	(14.11)	(20.97)	(0.00)	(2.25)	(13.80)	(16.86)
twB	0.00	0.00	2.56	2.56	5.13	2.56	15.38	10.26	61.54
	(0.00)	(0.00)	(6.34)	(7.99)	(9.95)	(6.34)	(26.02)	(12.40)	(35.06)
twCCC/CC	0.00	0.00	0.00	0.00	72.73	9.09	9.09	9.09	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(40.34)	(32.14)	(32.14)	(13.45)	(0.00)

Note: Numbers in parentheses are weighted standard deviations, weighted by the issuer base. D--Default. NR--Not rated. Source: S&P Global Fixed Income Research. Copyright © by Taiwan Ratings Corp. All rights reserved.



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Table 7

### Average Five-Year Transition Rates (1999-2017)

(%)

From/To	twAAA	twAA	twA	twBBB	twBB	twB	twCCC/CC	D	NR
twAAA	59.09	27.27	0.00	0.00	0.00	0.00	0.00	0.00	13.64
	(19.64)	(21.42)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(9.91)
twAA	5.43	82.77	2.62	0.00	0.00	0.00	0.00	0.00	9.18
	(5.64)	(6.16)	(1.46)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(2.46)
twA	0.00	18.99	56.42	3.91	0.56	0.00	0.00	0.93	19.18
	(0.00)	(13.87)	(15.05)	(3.74)	(1.10)	(0.00)	(0.00)	(1.03)	(6.45)
twBBB	0.00	7.12	25.70	26.01	0.31	0.00	0.00	3.41	37.46
	(0.00)	(6.35)	(26.37)	(18.28)	(1.51)	(0.00)	(0.00)	(5.14)	(17.34)
twBB	0.00	1.08	7.57	20.00	3.78	0.00	0.00	8.65	58.92
	(0.00)	(1.62)	(7.77)	(12.62)	(4.08)	(0.00)	(0.00)	(13.11)	(15.62)
twB	0.00	0.00	2.56	0.00	12.82	0.00	2.56	12.82	69.23
	(0.00)	(0.00)	(7.05)	(0.00)	(20.04)	(0.00)	(7.99)	(12.62)	(32.94)
twCCC/CC	0.00	0.00	0.00	0.00	18.18	9.09	0.00	72.73	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(43.12)	(13.45)	(0.00)	(40.34)	(0.00)

Note: Numbers in parentheses are weighted standard deviations, weighted by the issuer base. D--Default. NR--Not rated. Source: S&P Global Fixed Income Research. Copyright © by Taiwan Ratings Corp. All rights reserved.

Table 8

### Average Ten-Year Transition Rates (1999-2017)

(%)

From/To	twAAA	twAA	twA	twBBB	twBB	twB	twCCC/CC	D	NR
twAAA	41.54	43.08	0.00	0.00	0.00	0.00	0.00	0.00	15.38
	(15.67)	(8.07)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(10.36)
twAA	5.47	75.78	2.73	0.00	0.00	0.00	0.00	0.00	16.02
	(4.64)	(4.58)	(3.29)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(4.53)
twA	0.00	27.30	38.10	3.81	0.00	0.00	0.00	0.95	29.84
	(0.00)	(11.12)	(11.49)	(2.08)	(0.00)	(0.00)	(0.00)	(0.99)	(10.29)
twBBB	1.21	13.71	22.98	14.11	0.00	0.00	0.00	7.26	40.73
	(1.50)	(7.09)	(16.50)	(8.04)	(0.00)	(0.00)	(0.00)	(6.66)	(15.03)
twBB	0.00	2.27	3.41	6.25	0.00	0.00	0.00	13.64	74.43
	(0.00)	(2.49)	(3.61)	(5.41)	(0.00)	(0.00)	(0.00)	(11.05)	(6.20)
twB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.56	69.44
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(31.57)	(31.57)
twCCC/CC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: Numbers in parentheses are weighted standard deviations, weighted by the issuer base. D--Default. NR--Not rated. Source: S&P Global Fixed Income Research. Copyright © by Taiwan Ratings Corp. All rights reserved.

## **Appendix I: Methodology And Definitions**

An issuer credit rating reflects TRC's opinion of a company's overall capacity to pay its obligations (that is, its fundamental creditworthiness). This opinion focuses on the obligor's ability and willingness to meet its financial commitments on a timely basis, and it generally indicates the likelihood of default regarding all financial obligations of the firm. It is not necessary for a company to have rated debt in order to be assigned an issuer credit rating.

S&P Global Fixed Income Research's ongoing enhancement of the default database used to generate this study may lead to outcomes that differ to some degree from those reported in previous studies. However, this poses no continuity problem because each study reports statistics back to Dec. 31, 1998. Therefore, each annual default study is self-contained and effectively supersedes all previous versions.

### ***Issuers included in this study***

This study analyzes the rating histories of 305 companies to which TRC had assigned ratings as of Dec. 31, 1998, or that were first rated between that date and Dec. 31, 2017. These include industrials, utilities, insurance companies, financial holding companies, banks, securities firms, and other financial services in Taiwan with long-term credit ratings. The study includes publicly and confidentially rated entities, as well as those with ratings that were withdrawn after initial assignment. The analysis excludes public information ("pi") ratings and ratings based on the guarantee of another company. Structured finance vehicles, public-sector issuers, and sovereign issuers are the subjects of separate default and transition studies and are excluded from this study.

To avoid over counting, we exclude subsidiaries with debt that is fully guaranteed by a parent or with default risk that is considered identical to that of a parent, where both the parent and subsidiaries have Taiwan national scale ratings. The latter are companies with obligations that are not legally guaranteed by a parent but that have operating or financing activities that are so inextricably entwined with those of the parent that it would be impossible to imagine the default of one and not the other. At times, however, some of these subsidiaries might not have been covered by a parent's guarantee, or the relationship that combines the default risk of parent and subsidiary might have come to an end or might not have begun. We include such subsidiaries for the period during which they had a distinct and separate risk of default.

### ***Definition of default***

A default event is recorded on the first occurrence of a payment default on any financial obligation, rated or unrated, other than a financial obligation subject to a bona fide commercial dispute; an exception occurs when an interest payment missed on the due date is made within the grace period. Preferred stock is not considered a financial obligation; thus, a missed preferred stock dividend is not normally equated with default. However, we consider distressed exchanges to be defaults whenever the debtholders are coerced into accepting substitute instruments with lower coupons, longer maturities, or any other diminished financial terms.

TRC will usually lower an issue rating to 'D' (default) following a company's default on the corresponding obligation. In addition, 'SD' (selective default) is used whenever it is believed that an obligor that has selectively defaulted on a specific issue or class of obligations will continue to meet its payment obligations on other issues or classes of obligations in a timely matter. An 'R' (regulatory intervention) issuer rating indicates that an obligor is under regulatory supervision owing to its financial condition. This does not necessarily indicate a default event, but the regulator may have the power to favor one class of obligations over others or pay some obligations and not others. We deem 'D', 'SD', and 'R' issuer ratings to be defaults for the purpose of this study. A default is assumed to take place on the earliest of: the date TRC revised the ratings to 'D',

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'SD', or 'R'; the date when a debt payment was missed; the date a distressed exchange offer was announced; or the date the debtor filed for or was forced into bankruptcy.

### ***Static pool methodology***

S&P Global Fixed Income Research conducts its default studies on the basis of groupings called static pools. These are formed by grouping issuers by rating category at the beginning of each year covered by the study. Each static pool is followed from that point forward. All companies included in the study are assigned to one or more static pools. When an issuer defaults, that default is assigned back to all of the static pools to which the issuer belongs.

We use the static pool methodology to avoid certain pitfalls in estimating default rates, such as to ensure that default rates account for rating migration and to allow default rates to be calculated across multiperiod time horizons. Some methods for calculating default and rating transition rates might charge defaults against only the initial rating on the issuer, ignoring more recent rating changes that supply more current information. Other methods may calculate default rates using only the most recent year's default and rating data, which may yield comparatively low default rates during periods of high rating activity because they ignore prior years' default activity.

The pools are static in the sense that their membership remains constant over time. Each static pool can be interpreted as a buy-and-hold portfolio. Because errors, if any, are corrected by every new update and because the criteria for inclusion or exclusion of companies in the default study are subject to minor revisions as time goes by, it is not possible to compare static pools across different studies. Therefore, every new update revises results back to the same starting date of Dec. 31, 1998, to avoid continuity problems.

Entities that have had ratings withdrawn--that is, revised to 'NR' (not rated)--are surveilled with the aim of capturing a potential default. These companies, as well as those that have defaulted, are excluded from subsequent static pools.

For instance, the 1999 static pool consists of all companies rated as of 12:01 a.m. on Jan. 1, 1999. Adding those companies first rated in 1999 to the surviving members of the 1999 static pool forms the 2000 static pool. All rating changes that took place are reflected in the newly formed 2000 static pool. This same method was used to form static pools for 2001-2017.

Consider the following example: An issuer is originally rated 'twBB' in mid-1998 and is downgraded to 'twB' in 2000. This is followed by a rating withdrawal ('NR') in 2002 and a default ('D') in 2005. This hypothetical company would be included in the 1999 and 2000 pools with the 'twBB' rating assigned to it at the beginning of those years; likewise, it would be included in the 2001 and 2002 pools with the 'twB' rating. It would not be part of the 1998 pool because it was not rated as of the first day of that year, and it would not be included in any pool after the last day of 2002 because the rating had been withdrawn by then. Yet each of the four pools in which this company was included (1999-2002) would record its 2005 default at the appropriate time horizon.

Ratings are withdrawn when an entity's entire debt is paid off or when the program or programs rated are terminated and the relevant debt extinguished. This may also occur as a result of mergers and acquisitions. Other ratings are withdrawn because of a lack of cooperation, particularly when a company is experiencing financial difficulties and refuses to provide all the information needed to continue surveillance on the ratings.

### ***Default rate calculation***

Annual default rates are calculated for each static pool: first in units, and later as percentages with respect to the number of issuers in each rating category. Finally, these percentages are combined to obtain cumulative default rates for the 19 years covered by the study.

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### ***Issuer-weighted default rates***

Averages that appear in this study are calculated based on the number of issuers rather than the dollar amounts affected by defaults or rating changes. Although dollar amounts provide information about the portion of the market that is affected by defaults or rating changes, issuer-weighted averages are more useful measures of the performance of ratings.

Many people in the investment field use statistics from this default study to estimate the probability of default and the probability of rating transition. It is important to note that we do not imply a specific probability of default; however, our historical default rates are frequently used to estimate these characteristics.

### ***Average cumulative default rate calculation***

Cumulative default rates that average the experience of all static pools are derived by calculating marginal default rates, conditional on survival (survivors being nondefaulters), for each possible time horizon and for each static pool, weight-averaging the conditional marginal default rates, and accumulating the average conditional marginal default rates. Conditional default rates are calculated by dividing the number of issuers in a static pool that default at a specific time horizon by the number of issuers that survived (did not default) to that point in time. Weights are based on the number of issuers in each static pool. Cumulative default rates are one minus the product of the proportion of survivors (nondefaulters).

### ***Time sample***

This update limits the reporting of default rates to the selected time horizon; however, the data have been gathered for 19 years, and all calculations are based on the rating experience of that period. The maturities of most obligations are much shorter than the selected time horizon. In addition, average default statistics become less reliable at longer time horizons because the sample size becomes smaller and the cyclical nature of default rates increases its effect on averages.

Default patterns share broad similarities across all static pools, suggesting that TRC's rating standards have been consistent over time. Adverse business conditions tend to coincide with default upswings for all pools. Speculative-grade issuers have been hit the hardest by these upswings, but investment-grade default rates also increase in stressful periods.

### ***Transition analysis***

Transition rates compare issuer ratings at the beginning of a period with ratings at the end of the period. To compute one-year rating transition rates by rating category, the rating on each entity at the end of a particular year is compared with the rating at the beginning of the same year. An issuer that remained rated for more than one year is counted as many times as the number of years it was rated. For instance, an issuer continually rated from the middle of 1998 to the middle of 2003 would appear in the four consecutive one-year transition matrices from 1999-2002. All 1999 static pool members still rated on Dec. 31, 2017, had 19 one-year transitions, while companies first rated between Jan. 1, 2017, and Dec. 31, 2017, had only one.

Each one-year transition matrix displays all rating movements between letter categories from the beginning of the year through year-end. For each rating listed in the matrix's leftmost column, there are nine ratios listed in the rows, corresponding to the ratings from 'twAAA' to 'D', plus an entry for 'NR'.

*Practical application of transition rates*

Rating transition rates are useful to investors and credit professionals for whom rating stability is important. For instance, investors who are restricted by law or are inclined to invest in top-grade bonds would want to assess the likelihood that TRC analysts will continue to assign higher ratings to their investments. Conversely, investors buying high-yield bonds in hopes of profiting from an upgrade would be able to gauge that expectation.

The credit community might also use rating transition information, in part to determine maturity exposure limits or to measure credit risk in the context of the value-at-risk models. Rating transition matrices could also be constructed to produce stressed default rates. Such matrices are often used for credit risk measurement. In addition, multiyear transition matrices are valuable tools that can be used to forecast future rating distributions and may be better suited for certain applications than one-year transition matrices.

*Comparing transition rates with default rates*

Rating transition rates may be compared with the marginal and cumulative default rates described in the previous section. For example, the one-year default rate column of table 4 is equivalent to column 'D' of the average one-year transition matrix in table 5. Average cumulative default rates are the summary of all static pools from 1999-2017, while the number of pools used in the average transition rate is limited by the transition's time horizon.

## **Appendix II: Gini Methodology**

To measure relative ratings performance, we utilize the Lorenz curve as a graphical representation of the proportionality of a distribution, and we summarize this via the Gini coefficient. For this study, the Lorenz curve is plotted with the x-axis showing the cumulative share of issuers, arranged by rating, while the y-axis represents the cumulative share of defaulters, also arranged by rating. For both axes of the Lorenz curve, the observations are ordered from the low end of the ratings scale ('twCCC'/'twC') to the high end ('twAAA').

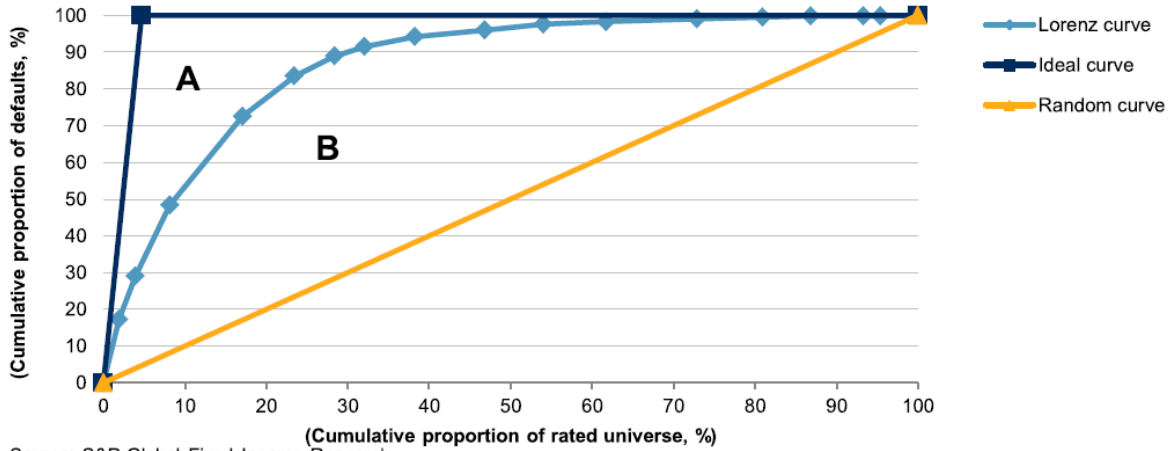
As an example, if 'twCCC'/'twC' rated entities made up 10% of the total population of issuers at the start of the time frame examined (x-axis) and 50% of the defaulters (y-axis), then the coordinate (10, 50) would be the first point on the curve. If S&P Global Ratings' corporate ratings only randomly approximated default risk, the Lorenz curve would fall along the diagonal. Its Gini coefficient--which is a summary statistic of the Lorenz curve--would thus be zero. If corporate ratings were perfectly rank ordered so that all defaults occurred only among the lowest-rated entities, the curve would capture all of the area above the diagonal on the graph (the ideal curve), and its Gini coefficient would be 1 (see chart 5).

The procedure for calculating the Gini coefficients is illustrated in chart 5: Area B is bounded by the random curve and the Lorenz curve, while area A is bounded by the Lorenz curve and the ideal curve. The Gini coefficient is defined as area B divided by the total of areas A plus B. In other words, the Gini coefficient captures the extent to which actual ratings accuracy diverges from the random scenario and aspires to the ideal scenario.

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Chart 5

## Sample Lorenz Curve



Source: S&P Global Fixed Income Research.

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## Related Research

- 2017 Annual Global Corporate Default Study And Rating Transitions, April 5, 2018
- 2017 Ratings Roundup Report, [www.taiwanratings.com](http://www.taiwanratings.com) - January 10, 2018

*The use of the term "methodology" in this article refers to data aggregation and calculation methods used in conducting the research. It does not relate to S&P Global Ratings' methodologies, which are publicly available criteria used to determine credit ratings.*

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