Insight

CRISIL RATINGS

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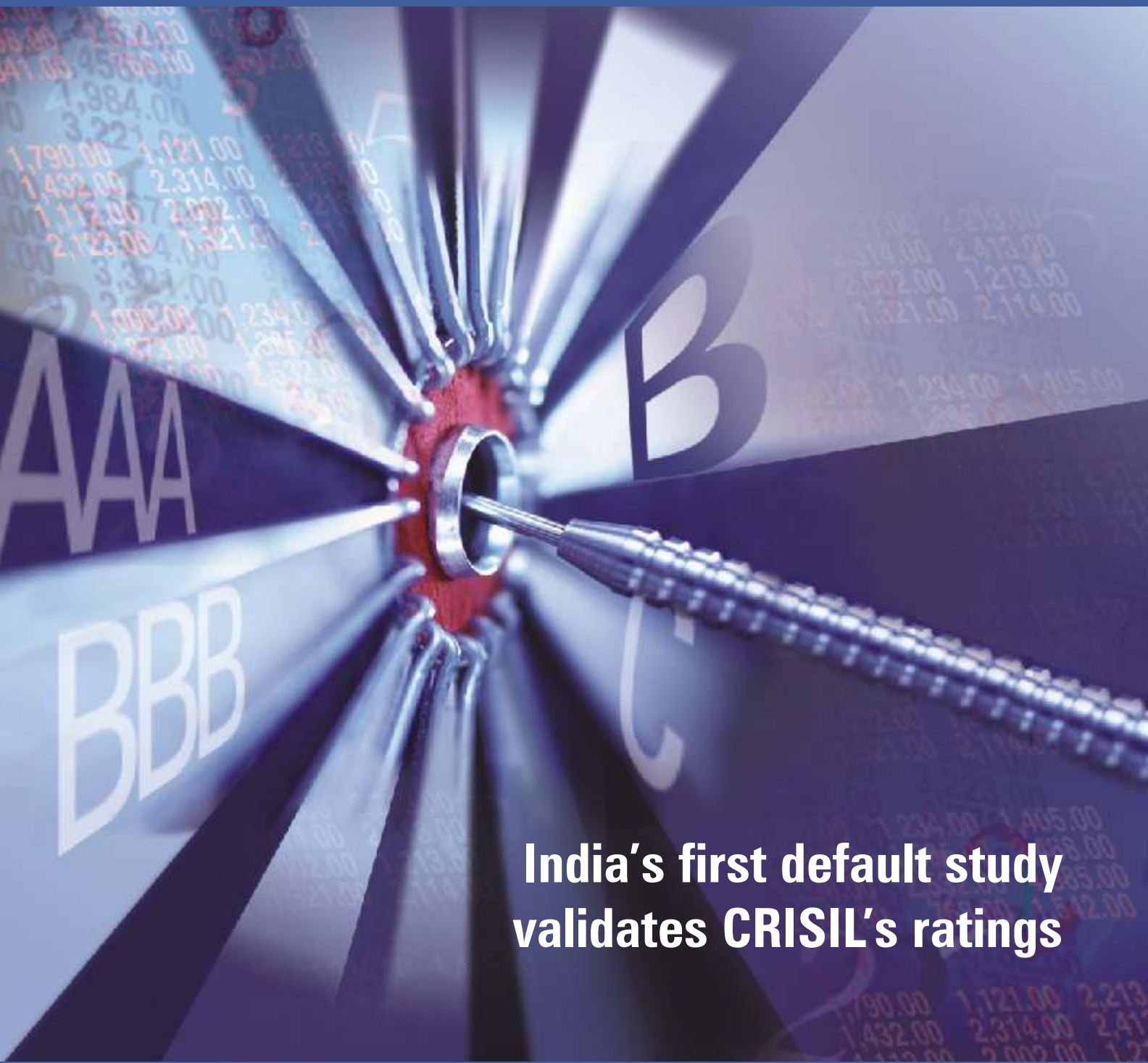
CRISIL Default Study 2004 - 05



India's first default study validates CRISIL's ratings

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The first study of defaults ever published by a rating agency in India validates CRISIL's ratings as reliable measures of default probability. CRISIL's ratings have demonstrated **high calibration accuracy** with higher ratings translating into a lower likelihood of default. At over 83 per cent, **the high stability rates** of CRISIL's ratings compare well with those of international rating agencies. Similarly, CRISIL's ratings have strongly demonstrated their **default prediction ability** over the 13 years covered in the study, as reflected in the high accuracy ratio of 0.80. The strong performance on these three critical parameters underlines the robustness of CRISIL's rating processes.

CRISIL's study also highlights a **declining trend in default rates.** Default rates observed over the last five years (2000-2004) for CRISIL-rated entities have been significantly lower than those over the 13-year period covered under this study, from 1992 to 2004. The study is based on CRISIL's rating database spanning 13 years and covering two full economic cycles. **The quality, depth, and size of this database make it the most robust in the Indian context.**

CRISIL's default rates are underpinned by a clear, unambiguous definition of default. CRISIL believes that it is the only credit rating service operating in India that clearly defines default as missed payment, and consistently proceeds to reset ratings of defaulting entities to 'D' immediately on being aware of the occurrence of default. CRISIL believes that such a digital approach to acknowledgment of default is an absolute pre-requisite for compilation of meaningful default statistics. Market participants can rely on default rates only if computation is based on an unambiguous definition of default, and on its rigorous reflection in actual rating actions.

At a time when the implementation of Basel II capital adequacy norms is under way, and banks are in the process of compiling data related to internal ratings and defaults, CRISIL sees the publication of its default rates as a key milestone. Further, as Indian financial markets gain in sophistication and maturity, default data is becoming a critical input for some of the most important decisions in the financial system, including debt pricing, provisioning, and risk management.

Based on a large and diverse data set, and a rigorous default definition, and having stood the test of various measures of validation, CRISIL's default rates are the most reliable estimate of default probability in the Indian market.

Box 1: The data set

CRISIL's study of defaults draws on its ratings history of 13 years, across manufacturing, finance, and infrastructure sectors. CRISIL's data is the largest ratings database[1] available in India, encompassing over 4000 issuer-years. Significantly, it spans two full economic cycles between 1992 and 2004. CRISIL's database is the largest and most diverse such database available in India today. This is extremely critical, as meaningful and robust default rates can only be based on a large and varied sample.

Definition of Default

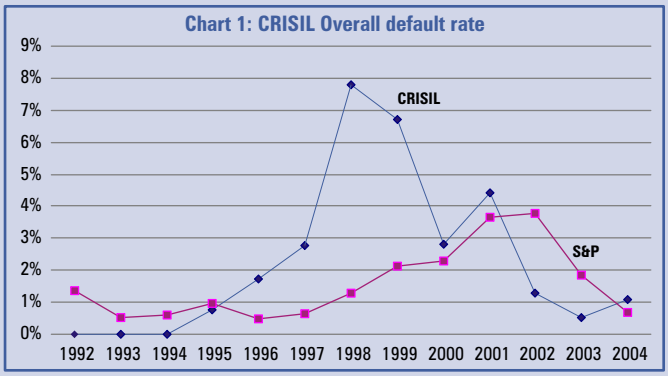
CRISIL defines default as any missed payment on a rated instrument. This means that even a single day's delay, or a shortfall of even a single rupee, in terms of the promised repayment schedule, would amount to a 'default'. Any post-default recovery is not factored in by CRISIL's ratings.

This rigorous and transparent definition of default provides a firm foundation for the study of CRISIL's default rates, and makes its default rates meaningful and reliable. The fact that this definition has been in place for several years, and is strictly and consistently applied, ensures that the data used for this study is consistent and comparable. This rigorous approach underpins the validity of CRISIL's conclusions. Given its observation that other rating services operating in India adopt varying approaches to the definition of default, CRISIL believes that this study is not only the first, but also the most reliable default study providing valuable insights to investors today. It is important to contrast default studies using this digital approach to default, with those default studies that might use a more relaxed or inconsistent definition of default, which is likely to yield lower default rates. Such studies would be less rigorous, and would have lower utility in pricing and provisioning decisions.

[1] The data used for this analysis includes long-term ratings, and long-term ratings implicit in Fixed-Deposit ratings, but excludes structured finance ratings and short-term ratings.

Decline in default rates

The movement of overall annual default rates (the proportion of total defaults to total outstanding ratings in a particular year) for CRISIL's ratings is shown in Chart 1. The statistics indicate that, since 1998, CRISIL default rates have been steadily declining. Over the last five years, CRISIL's default rates have been comparable to those of Standard and Poor's (S&P) globally.

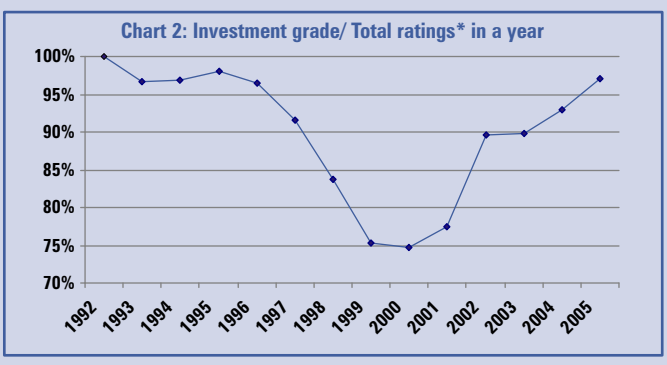


Source: *CRISIL Ratings Database, Standard & Poor's Annual Global Corporate Default Study: Corporate Defaults Poised to Rise in 2005, January 2005*

CRISIL's default rates for the last five years (2000-2004), standing at an average of 2.27 per cent, show an improvement over default rates observed over the 13-year period of this study (1992-2004) at 2.95 per cent. Moreover, about 70 per cent of defaults in CRISIL's portfolio, till date, occurred during the period 1997-1999, resulting in an upward bias to CRISIL's overall historical default rates. These defaults during 1997-1999 were due to the simultaneous occurrence of a number of events, including economic recession, and structural/ regulatory changes, especially in the financial sector. Although economic cycles will continue, CRISIL believes that structural and regulatory changes of this magnitude are unlikely in the future, thus rendering the possibility of a repeat of the 1997-1999 default rates remote.

The improvement in overall default rates post-2000 is a result of:

- The improving default rates in each category-incremental default rates for all categories have declined considerably in the last five years (Tables 1 and 2)
- The improving category-wise distribution of ratings-the proportion of investment grade companies in CRISIL's rated portfolio has been increasing consistently (as chart 2 will illustrate); additionally, several companies with low ratings, after defaulting in the 1997-1999 period, have not subsequently been rated



** Based on all non-default category ratings*

The proportion of Investment-grade companies[2] is currently at a ten-year high. In CRISIL's portfolio, investment grade ratings as a proportion of total non-default category ratings have increased to 97 per cent in 2005 from 75 per cent in 2000. This, coupled with the reducing incremental default rates experienced across all categories, signals continued low overall default rates in CRISIL's portfolio in the short to medium term.

[2] To compute this proportion, companies only in non-default category are considered

Calibration Accuracy

The default rate of a rating category measures the likelihood of a rating in that category going to default during a given time horizon; it is used to quantify default risk. CRISIL's ratings being opinions on default risk, high ratings should translate into low default rates.

The inverse correlation between CRISIL's credit ratings and default probabilities is evident from Table 1 and Chart 3. This correlation is also visible in the data for the most recent five-year period (2000-2004), as Table 2 and Chart 4 illustrate.

Table 1: CRISIL Average Cumulative Default Rates (withdrawal-adjusted) (%), 1992-2004

Rating	Sample size	1-year	2-year	3-year
AAA	447	0.00	0.00	0.00
AA	1229	0.00	0.56	1.64
A	1386	1.01	4.43	9.01
BBB	606	3.47	9.02	17.71
Investment grade (AAA to BBB)	*3668*	*0.96*	*3.31*	*6.72*
Speculative grade	*445*	*19.33*	*32.72*	*42.18*

Source: CRISIL RiskPRO© Version 2.0

Note: The figures in the 1-year, 2-year and 3-year columns reflect percentages of the ratings in the category to have defaulted over the said periods. Percentages for any one column or row are not additive.

Chart 3: CRISIL Average Cumulative Default rates (Withdrawal-adjusted), 1992-2004

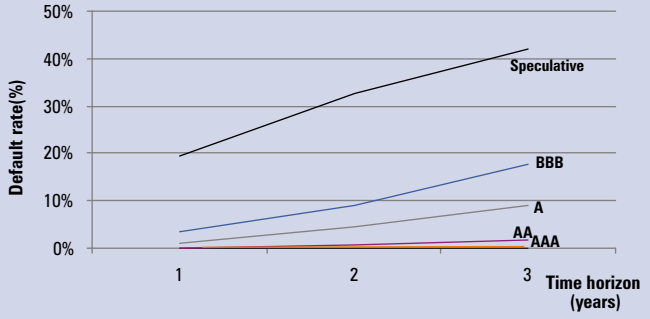


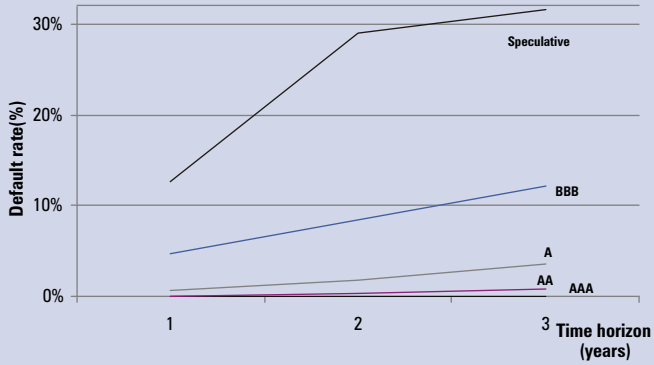
Table 2: CRISIL Average Cumulative Default Rates (Withdrawal-adjusted) (%), 2000-2004

Rating	Sample size	1-year	2-year	3-year
AAA	262	0.00	0.00	0.00
AA	456	0.00	0.30	0.76
A	279	0.72	1.80	3.50
BBB	108	4.63	8.37	12.19
Investment grade (AAA to BBB)	*1105*	*0.63*	*1.28*	*2.07*
Speculative grade	*173*	*12.71*	*29.08*	*31.70*

Source: CRISIL RiskPRO© Version 2.0

Note: The figures in the 1-year, 2-year and 3-year columns reflect percentages of the ratings in the category to have defaulted over the said periods. Percentages for any one column or row are not additive.

Chart 4: CRISIL Average Cumulative Default rates (withdrawal-adjusted), 2000-2004



This is empirical evidence that CRISIL's rating scale is well-calibrated, with higher ratings consistently implying lower probabilities of default. These ratings therefore corroborate CRISIL's rating definitions.

Improvement in Investment grade stability rates

Stability rates are a measure of the historically observed probability of ratings remaining unchanged, i.e. not showing any transition over a given time horizon. Transition rates indicate the probability of a given rating moving to other rating categories. The risk an investor faces from transition is the risk of rating downgrades. Transition rates are thus particularly relevant for investors with time horizons shorter than the maturity of the debt instrument, and for investors who need to regularly mark their investments to market.

Table 3: CRISIL One-year Average Transition Rates (Withdrawal-adjusted) (%), 1992-2004

Rating	Sample size	AAA	AA	A	BBB	BB	B	C	D
AAA	447	**96.64**	3.36	0.00	0.00	0.00	0.00	0.00	0.00
AA	1229	2.36	**89.26**	7.24	0.57	0.33	0.16	0.08	0.00
A	1386	0.00	3.61	**82.40**	7.50	4.40	0.22	0.87	1.01
BBB	606	0.00	0.33	5.45	**73.27**	14.19	1.65	1.65	3.47
BB	328	0.00	0.61	0.00	1.83	**75.30**	0.91	5.49	15.85
B	33	0.00	0.00	0.00	6.06	0.00	**57.58**	6.06	30.30
C	84	0.00	0.00	0.00	1.19	0.00	0.00	**70.24**	28.57

Source: CRISIL RiskPRO© Version 2.0

CRISIL's one-year average stability rates[3] have been generally higher for higher rating categories. Like default risk, transition risk has also declined over the last few years. The overall stability rates of CRISIL's ratings, particularly those of its AAAs, AAs, and As have improved compared to previous one-year averages. Moreover, though BBBs experienced a lower stability rate, this was mainly due to more upgrades than before.

Table 4: Comparison of CRISIL One-year Average Stability Rates (withdrawal-adjusted) (%)

Data set	AAA	AA	A	BBB	Overall*
1992-2004	96.64	89.26	82.40	73.27	83.64
1992-2003	96.17	89.19	82.34	73.41	83.32
1992-2002	95.50	86.30	82.80	75.50	82.10

** All non-default category ratings*

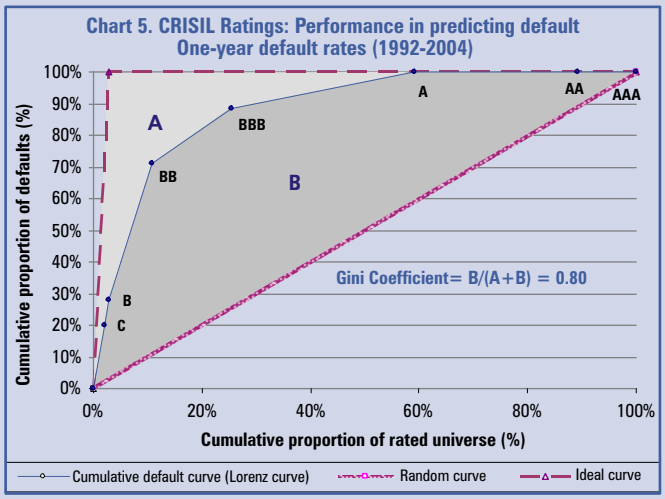
CRISIL's high and improving overall stability rates are comparable to those of global rating agencies.

[3] The stability rate can be understood as the likelihood of no transition. The diagonal elements in the transition matrix indicate the stability rate for various rating categories. For example, Table 3 tells us that on average 89.26 per cent of AAs have remained at AA, 2.36 per cent have been upgraded to AAA, and only 8.38 per cent have been downgraded, in a year.

Historical Predictive ability of CRISIL's ratings: Strong and improving

The Gini coefficient, also known as accuracy ratio, is a measure of the historically demonstrated ability of ratings to predict defaults, and is used to validate a rating system. The higher the value of the Gini coefficient, the better the predictive performance of the ratings.

Using data from 1992 to end-2004, the Gini coefficient for CRISIL's ratings is 0.80, which is marginally lower than S&P's global average of 0.84.



This is the first time an Indian rating agency has used this powerful and objective tool to validate the predictive ability of its ratings. The high Gini coefficient of 0.80 indicates that CRISIL's ratings have displayed a strong ability to predict default.

Box 2: How to read Chart 5

If ratings had no default predictive ability, then default rates and ratings would show no relationship. For example, assume 30 defaults occur in one year out of 1000 ratings (i.e. default rate of 3%). If ratings were not predictive, then, in any randomly selected 100 companies (10% of rated population) one would expect to see 3 defaulted companies (10% of defaulted population) getting selected. This indicates that the number of defaults one would expect to observe in a sample is only proportional to the selected number of companies, and will have no relation to ratings, because defaults will be randomly distributed across all rating categories. This is represented by the random curve. In such a case, since ratings have no predictive power, the random curve will be a diagonal straight line. On the other hand if ratings are perfect predictors of default, then in the given example the worst 30 ratings should capture all the defaults. This is represented by the ideal curve. Since no rating system is perfect, the actual predictive power lies between these two extremes. The cumulative curve represents the actual experience. The closer the curve is to the ideal curve, the better the predictive power of the ratings. This is quantified by measuring the area between the cumulative curve and random curve (area 'B' in the chart) in relation to the area between the ideal curve and random curve (area 'A'+'B' in the chart). This ratio of B/(A+B), called Gini coefficient or accuracy ratio will be closer to 1 if ratings have excellent predictive ability, as the cumulative curve will almost coincide with ideal curve. On the other hand it will be closer to zero if ratings have poor predictive power, as in this case the cumulative curve will almost coincide with the random curve.

Conclusion: empirical evidence validates CRISIL's ratings

The calibration accuracy, stability and predictive ability of CRISIL's ratings demonstrate the strength of CRISIL's rating processes. These processes have been set up, stabilised, and refined in the light of CRISIL's years of rating experience, and their robustness is today recognised by both issuers and investors.

CRISIL's default rates show a declining trend. The overall stability rate for CRISIL's ratings is also healthy and improving. Moreover, this study presents empirical evidence that CRISIL's ratings are well-calibrated and have shown a track record of good predictive ability.

Box-3: Importance of Rating default and transition statistics

For all debt market participants, accurate and robust default and transition rates are critical inputs in the following decisions:

Pricing of debt

Default rates summarise the historical default experience of a portfolio of credits. This is a fundamental input to the pricing of a debt/loan. Default probabilities associated with ratings help investors/lenders in quantifying credit risk in their debt exposures, thus providing key inputs on whether to lend, how much to lend, and at what price.

Structuring and pricing of credit enhanced instruments

Structuring, rating and pricing of credit-enhanced products depends heavily on default and transition rates of underlying entities. The rapid growth of the structured finance market has made accurate computation of historical default and transition statistics imperative.

As critical inputs to credit risk measurement models

Default and transition rates are key inputs to many quantitative risk measurement models. Investors in rated paper can effectively manage their exposures based on reliable default and transition rates.

Insights on the rating process, stability and meanings of ratings

Ratings are an indicator of probability of default. In a well-calibrated rating scale, the default rates should increase as one moves down the rating scale. Default and transition rates could be used to validate rating scales and quantify rating stability.

Box-4. Default and Transition rate Methodology

Concept of Static pool

A static pool of a year is a set/pool of companies having an outstanding rating at the beginning of that year. The membership of the pool remains static/constant over time. For a company to be included in an n-year static pool, it has to be outstanding throughout the entire n years. Companies that withdraw or default in between will remain withdrawn or in default for the remaining years. A company that gets a rating subsequently, or recovers from default, is considered a new company in that year's static pool. A company that remains rated for more than one year is counted as many times as the number of years over which it was rated. This assumes that all ratings are kept current through an ongoing surveillance process.

For instance, a company continually rated from 1 January, 1995, to 1 January, 2000, would appear in five consecutive static pools, while a company first appearing on 1 January, 2002, and having an outstanding rating till 1 January, 2003, will only appear in the 2002 static pool. As this analysis is for annual default/transition statistics, only the net effect of multiple rating changes, if any, in a year is recorded.

Marginal default rate

Notations:

For CRISIL's data,

Y = Year of formation of the static pool (1992 to 2004)

R = A given rating category on the Rating Scale (AAA to C)

t = Years from the formation of the static pool (1,2,3, 4…)

$M_t^Y(R)$ = defaults from rating category 'R' in t^{th} year of Y-year static pool

$N_t^Y(R)$ = Non-defaulted ratings outstanding in t^{th} year in rating category 'R' from the Y-year static pool

Illustration[4]: Consider a hypothetical static pool formed in the year 1985, and having 100 companies outstanding at a rating of 'BB' at the beginning of the year. Suppose, out of this pool, there is one default in the first year, three in the second year, and none in the third year. Also assume there are no withdrawals in any year. Then, using the above notation,

$M_1^{1985}(BB) = 1, M_2^{1985}(BB) = 3$, and $M_3^{1985}(BB) = 0$

$N_1^{1985}(BB) = 100, N_2^{1985}(BB) = 99$, and $N_3^{1985}(BB) = 96$

For rating category 'R', the t^{th} year marginal default rate for Y-year static pool is the probability of a firm, in the static pool formed at the starting of the year Y, surviving till the end of period (t-1) and defaulting only in year t.

Mathematically, the marginal default rate for category 'R' in year t from Y static pool, $MDRt^Y(R)$, is defined as

$MDRt^Y(R) = Mt^Y(R) / Nt^Y(R)$

Therefore, $MDR_1^{1985}(BB) = M_1^{1985}(BB) / N_1^{1985}(BB) = 1/100 = 0.01$

Cumulative Average default rate

The concept of survival analysis is used to compute the cumulative default probabilities. We calculate the cumulative probability of a firm defaulting as follows:

The cumulative probability of a firm defaulting by the end of (t+1) years	=	[Cumulative probability of the firm defaulting by the end of t years + Probability of the firm defaulting in (t+1) th year]

Further, for a firm to default in $(t+1)^{th}$ year, it should survive till the end of t years. So,

Probability of the firm defaulting in (t+1)th year	=	[Probability of the firm surviving till end of t^{th} year * Marginal Probability of the firm defaulting in $(t+1)^{th}$ year]

Now,

Probability of the firm surviving till the end of t^{th} year	=	1- Cumulative probability of the firm defaulting by the end of t years

Hence,

Probability of the firm defaulting in $(t+1)^{th}$ year	=	[(1- Cumulative probability of the firm defaulting by the end of t years) * Marginal Probability of the firm defaulting in $(t+1)^{th}$ year]

Therefore, returning to the first expression,

The cumulative probability that a firm defaults by the end of (t+1) years	=	Cumulative probability of the firm defaulting by the end of t years	+	[(1- Cumulative probability of the firm defaulting by the end of t years) * (Marginal Probability of the firm defaulting in $(t+1)^{th}$ year)]

[4] This illustration is for explanatory purposes only, and does not indicate the actual or observed probabilities of default in any rating category

Restating the above in notation, if $CPD_{t+1}(R)$ = cumulative default probability of a firm rated R defaulting in t+1 years, then,

$CPD_t(R) = MDR_t(R)$; for t=1

$CPD_{t+1}(R) = CPD_t(R) + (1- CPD_t(R)) * MDR_{t+1}(R)$; for t=2,3…5 etc.

This iterative computation is repeated for all static pools, and a weighted average (weighted by the category-wise sample sizes) is taken to compute the overall default rate.

Withdrawal adjustment

In the year subsequent to its having obtained the rating, the firm can move to three different states it can be timely on payments (and have a non-default rating outstanding), can default, or can repay the debt and withdraw the rating. As firms are not monitored post-withdrawal, the 'true state' (whether default or no default) of a firm whose rating has been withdrawn remains unknown in subsequent years. Therefore, a modified $MDR_t^Y(R)$ that ignores withdrawn firms is an appropriate measure of marginal default probability. As mentioned earlier, $N_t^Y(R)$ is also adjusted for the firms that belong to the static pool and have defaulted by the start of year t. The modified $N_t^Y(R)$ is:

$N_t^Y(R)$ = Number of firms in the static pool formed at the starting of year Y with rating category R
- Number of defaults till the end of period (t-1)
- Number of withdrawn firms till end of period t.

As reliable information meeting CRISIL's stringent requirements is not available post-withdrawal, withdrawal-adjusted default rates have been used for this study.

Post-default return of a firm

Post-default, firms sometimes recover and, consequently, receive a non-default rating in subsequent years. As CRISIL's credit rating is an indicator of the probability of default, default is considered an "absorbing state" i.e. a firm cannot come back to its original static pool post-default. In static pool methodology, the recovered firm is considered a new firm that appears in the static pool of the year in which it recovered.

Methodology for transition rates

The t-year transition rate (from rating R1 to rating R2) for the static pool formed at the start of year Y, is the proportion of firms rated R1 at the beginning of static pool, that are found to be in R2 at the end of t years. This proportion is called the t-year transition probability from R1 to R2. The t-year transition matrix is formed by computing transition probabilities from various rating categories (except D) to other rating categories.

Withdrawal-adjusted transition rates are computed as mentioned above, but excluding companies that are withdrawn at the end of the t years.

In computation of t-year transition rates, ratings at a point of time, and at the end of the t^{th} year thereafter, are considered. Therefore, the firm does not drop out of the sample when withdrawn in between.

About RiskPRO© 2.0

RiskPRO© 2.0 is a software developed by CRISIL to compute default and transition statistics. The computations can be based on user's own database or on CRISIL's database. CRISIL's database has ratings history of long-term ratings and long-term rating implicit in fixed deposit ratings for all companies rated by CRISIL from 1992 till date. The default and transition statistics can be computed for different Sectors (Manufacturing, Finance and Infrastructure), Static pools, and at various granularity levels (Rating modifiers, category and grade) etc.

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