



The Pakistan Credit Rating Agency Limited

PACRA RATING TRANSITION METHODOLOGY

CRITERIA

DECEMBER 2010

1. INTRODUCTION

- *Tracking a CRA’s performance across time*
- *Measuring stability and accuracy of ratings*
- *Assessing quality for BOTH CRAs & Investors*

1.1 Transition and default *statistics* are a *quantitative* tool to gauge the *performance* of a credit rating agency (CRA) over a period of time. To measure the performance of its credit ratings by employing this tool, a CRA *conducts* historical studies to *track* default rates and rating transitions, which is *how much* and *how often* a rating has changed, *up or down*, over a certain period of time. Agencies may use these studies to *refine* and *evolve* their analytic methods in forming their rating opinions.

1.2 Transition and default studies are used by *investors, regulators, and other credit professionals* because they show the *relative stability* and *volatility* of credit ratings. The publication of default and transition rates aids investors in quantifying the credit risk of their debt portfolios. Transition rates are particularly useful for those holding instruments for time horizons *shorter* than their maturities.

1.3 Generally, CRAs begin tracking their ratings as soon as they are initially assigned. Analyzing transition and default rates by *vintage*, which is the year in which the CRA first rates an entity / issuer, yields useful *insights* into creditworthiness “*through the lifecycle*” of the entity / issuer as it *attempts* to position itself *via a viz* a dynamic operating environment.

1.4 Transition and default studies become more *reliable* and *representative* as the data set expands *both* in terms of the number of entities / issuers (*overall and sector-wise*) and the number of years in which the ratings remain *outstanding*.

2. REGULATORY REQUIREMENTS & BEST PRACTICES

- In the interest of...*quality, transparency, & independence* of a CRA’s ratings

2.1 CRAs are required by *regulatory* legislature and international best practices to make public their transition and default statistics on a *periodic* basis in the interest of greater transparency, quality and independence of ratings. In the *aftermath* of the global credit crisis, there is renewed focus upon *disclosure* of CRAs’ performance.

Regulatory Requirements & Best Practices for CRA Performance Disclosure <i>A SNAPSHOT</i>		
Jurisdiction / Forum	Regulatory Requirement / International Best Practice	PACRA’s Compliance
Pakistan (SECP)ⁱ	i. CRAs to maintain on their official websites information (<i>spanning at least five (5) years</i>) relating to: <ul style="list-style-type: none"> ■ Actual default rates <i>experienced</i> in each rating category; <i>and</i> ■ Rating transitions <i>over time</i> 	Compliant

<p>Association of Credit Rating Agencies in Asia (ACRAA)ⁱⁱ</p>	<p>i. It is considered a <i>desirable best practice for a CRA to publish, at least annually, a default and transition study, along with the methodology used for calculating default rates.</i> The default study should provide, at a minimum, details regarding:</p> <ul style="list-style-type: none"> ■ Annual <i>default rates</i> for each rating category ■ 3-year average <i>cumulative default rates</i> ■ 1-year transition rates; <i>and</i> ■ <i>Predictive</i> ability of the assigned ratings (<i>Gini coefficient</i>) <p>ii. The default statistics are to be computed based on <i>recognition of default on the first date of missed payment or filing for bankruptcy, whichever is earlier.</i> This is <i>recommended</i> as it is an <i>unambiguous</i> approach and does not factor in <i>assumptions</i> of recovery and loss</p> <p>iii. In order to permit <i>mapping of default statistics</i> between national ratings of domestic and Global CRAs, the following <i>preconditions</i> are to be met:</p> <ul style="list-style-type: none"> ■ The default rates capture at least one <i>full economic cycle</i>ⁱⁱⁱ ■ The definition of default is <i>similar</i> to be compared and default is recognized <i>strictly</i> according to the definition, without exceptions ■ There is a <i>reasonably large sample size</i>^{iv} of both defaulted and surviving companies 	<ul style="list-style-type: none"> ■ Gini Coefficient <i>not</i> calculated till the time PACRA’s universe becomes more <i>representative</i> and broad based across the entire rating scales ■ PACRA’s definition of default has <i>provisions</i> for considering <i>grace periods</i> and <i>forbearance</i> offered by lenders. PACRA considers such definition more <i>practicable</i> taking into account the <i>stage of development</i> of corporate and banking sector in Pakistan
<p>International Organization Of Securities Commission (IOSCO)^v</p>	<p>i. <i>The CRA is to publish:</i></p> <ul style="list-style-type: none"> ■ The historical default rates <i>inside</i> each rating category ■ Whether the default rates have changed <i>over time</i> ■ An <i>explanation</i>, if the nature of the rating / other circumstances render a historical default rate <i>inappropriate</i>, statistically invalid, or otherwise likely to mislead the users of the rating 	<p style="text-align: center;">Compliant</p>

3. KEY CONSTITUENTS

- The Study's Data Set
- Performance tracked at the "Entity / Issuer" level

3.1 PACRA's rating opinion is an *impartial* and *objective* view that evolves out of a well-defined rating process incorporating both *qualitative* and *quantitative* factors. These include, amongst others, the *macro operating environment* and the relative *positioning* of an entity / issuer against its peers. For debt instruments, along with all these, the *structure of the debt instrument / issue* is taken into account, affording *security* to the lenders / investors in the event of default.

3.2 PACRA's ratings, along its Standard Rating Scale, are broadly categorized as *investment-grade* and *speculative-grade ratings*. Investment-grade ratings comprise **AAA**, **AA**, **A**, and **BBB-** rating categories (**AAA** being the strongest; **BBB-** being the lowest investment-grade rating), while the speculative-grade includes **BB**, **B** and **CCC** to **C** rating categories (**CCC - C** being highly speculative). The default category comprises two ratings – **SD (Selective Default)** and **D (Default)**^{vi}.

3.3 DATA SET: PACRA's transition and default studies are based on information obtained from PACRA's database of ratings and defaults. The data consists of the following categories of entities / issuers:

- Corporates
- Financial institutions

3.3.1 Within these categories, the study is limited to long-term *entity / issuer* public ratings. Moreover, it is not necessary for an entity / issuer to have rated debt (*either by PACRA or another CRA*) in order to be assigned an entity rating by PACRA. In the *context* of instruments / issues, preliminary ratings assigned before issuance, *if made public*, are attributed to the entity / issuer for the purpose of this study. Also, the fact that an instrument was not issued subsequent to its rating by PACRA has no *bearing* on the status of its consideration for this study. *Short-term entity / issuer* ratings, *insurer financial strength* (IFS) ratings and *structured finance* ratings are not part of this study.

3.3.2 The data set is refined by adjusting for:

- i. Multiple instruments / issues for a single entity / issuer
- ii. Multiple entities / issuers (related entities)
- i. **Multiple instruments / issues for a single entity / issuer:**

Rating transitions and defaults are tracked at the entity / issuer level rather than at the instrument / issue level. This is so, as the likelihood of default is primarily driven by the liability structure and operating performance of an entity / issuer. At the same time, entities / issuers often default on all their debt due to cross default provisions in instrument trust deeds. Therefore, multiple instruments / issues belonging to the same entity / issuer are consolidated so that one entity rating is used per entity / issuer. In cases where an entity rating does not exist in PACRA's universe, but an instrument / issue rating belonging to the entity / issuer does, a proxy-entity rating is assigned and employed for the purpose of the performance statistics. Thus, PACRA evolves a proxy entity rating by adjusting its existing instrument / issue rating for the security structure embedded therein as per its *Basic Notching Criteria*. It is noteworthy that even if an entity rating does exist assigned by another CRA (*domestic or international*), PACRA still prefers to employ its own adjustment / mapping exercise to reach a proxy entity rating.

PACRA’s Basic Notching Criteria for mapping instrument ratings into proxy entity ratings	
Nature of instrument	Notching (Proxy entity rating)
<i>Senior Secured</i>	Entity rating < Instrument rating
<i>Unsecured</i>	Entity rating = Instrument rating
<i>Subordinated</i>	Entity rating > Instrument rating

ii. **Multiple entities / issuers (related entities):** Issuing subsidiaries and affiliates (*together referred to as “related entities”*) are removed from the data set in cases where there is a *direct* relationship to the rating of the parent. This may be the result of: (a) a **legal guarantee** from the parent in support of the debt obligations of the rated entities, or (b) an **essential business relationship** between the parent and the related entities that exists such that the ratings of the latter are *predicated* upon the concept of implied support from the former. The objective of the *aforementioned* adjustment is to eliminate the impact of the migration of a series of ratings that are ultimately reliant upon one entity / issuer.

3.4 Each transition and default study issued by PACRA is *self-contained*. This is so as PACRA’s continuing *data enhancement* efforts may result in slightly different statistics than in previously published studies and statistics. In addition, *comparisons* with earlier studies should be viewed within the context of the differing methodologies and definitions, employed therein.

4. METHODOLOGY FOR TRACKING PERFORMANCE - EXPLANATION

- *Static Pools / Cohorts*
- *Calculating Transition Rates*
- *Calculating Default Rates*

4.1 Static Pools / Cohorts: PACRA conducts its transition studies on the basis of *groupings* called static pools or, alternatively **cohorts**^{vii}. **Static Pools** could be constructed for any time period. Static Pools smaller than one-month time period are not seen, as they do not *serve* any *practical* purpose. *Generally*, static pools are constructed for a *one-to-ten* year period.

4.1.1 Formation of Static Pools: The static pools are formed by grouping active and outstanding entities / issuers by rating notch at the beginning of each period covered by the study. Each static pool is then *followed* from that point forward. All entities / issuers included in the study are *assigned* to *one* or *more* static pools. The static pools are “*static*” in the sense that once an entity / issuer *becomes* part of one; it stays there, until withdrawn.

- It is noteworthy that *errors* in the static pool, *if any*, are corrected by every new update of the study. Moreover, because the criteria for *inclusion* and *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 starting date, so as to avoid *continuity* problems

■ For instance, ratings *active* and *outstanding* at the beginning of FY09 (at 12:01 AM on July 1’08), constitute the FY09 “*original*” (*withdrawal-unadjusted*) static pool. Subsequently, “*surviving*” (*not withdrawn*) entities / issuers of FY09 static pool are added to the entities / issuers *first rated* in FY09 to form the FY10 static pool

4.1.2 Withdrawn / discontinued ratings^{viii}: Entities / issuers that have had ratings withdrawn in a particular period are *excluded* from all subsequent static pools including the static pool that *corresponds* to the period in which they are withdrawn. The “*original static pools*” are thus *adjusted* for *withdrawn / discontinued* ratings at the

appropriate time horizon(s). The *rationale* behind this withdrawal-adjustment practice is to furnish a *truly* reflective base of “*outstanding throughout-the-period ratings*” for calculating transition and default rates.

- Withdrawn ratings are not monitored for defaults by PACRA. Hence, post-withdrawal defaults on ratings are not assigned back to the static pool(s) in which these ratings were *active* and *outstanding*

▪ **CONSIDER THE FOLLOWING SCENARIO:**

- **For instance, an entity / issuer is originally rated BB in mid-FY06 and PACRA downgrades the company to B in FY08. This is followed by a rating withdrawal in April FY10 and a default D in FY12. The last rating action, prior to withdrawal, was a downgrade to B- in January FY10**

- This hypothetical entity / issuer would be included in the FY07 and FY08 static pools with the BB rating, which it was rated at the beginning of those years
 - Likewise, it would be included in the FY09 and FY10 (Original static pool for FY10 is referred here) static pools with the B rating
 - It would not be included in any static pool after the last day of FY10 (June 30, 2010) because PACRA had withdrawn the rating by then. Furthermore, it would also be “*excluded*” in the withdrawal-adjusted static pool for FY10
 - The downgrade, just prior to withdrawal, would not be captured in the annual transition of FY10 static pool as the pool only captures the first and the last “rating state” during the pool period (July 1, 2009 – June 30, 2010, *in this case*) and ignores all *interim* rating states manifesting for the rating
 - Each of the three static pools in which this company was included (FY07 – FY09) would not record its FY12 default.
-

4.1.3 New entities / issuers: Entities / issuers *newly rated* by PACRA in any given period are included in the subsequent period’s static pool.

- **For instance, continuing the example in 4.1.2, the entity / issuer originally rated BB in mid-FY06 would not be part of the FY06 static pool because it was not rated as of the first day of that year. Instead, its performance would begin to be followed from the subsequent year, FY07, static pool.**
-

4.2 Rating Migration Analysis: Rating migration, as embodied by transition rates, is analyzed across *the broad rating categories* at the modifier (+/-) level, hence, taking into account all rating transitions: (i) through *notches* inside any single rating category, and (ii) *across* rating categories. The rating migrations represent a *distinct* historical period and are not meant to be *portraying* any predictive pattern that may *represent* future rating migration patterns.

4.2.1 **Transition Matrix:** The transition matrix *pinpoints* the migration of ratings across the major rating categories (e.g. from **A** to **BBB**), at the modifier level, which counts each notch change (e.g. from **A** to **A-**). The *vertical left-hand column* identifies ratings outstanding at the beginning of the period, while the *horizontal axis* offers information on the *migration pattern* of those (same) ratings by the period’s end. In the transition matrix, the diagonal, beginning with **AAA** and followed by **AA+** till **D** shows the relative *stability* of each rating category at the modifier level. Transition to “*withdrawal*” is depicted in the transition matrix with an entry marked “**WR**”. This entry is in “*numeral*” rather than “*percentage proportion*” form, as is the case for the rest of transition matrix output, and is meant to *impart* information upon withdrawn ratings, during the static pool period, from rating categories **AAA – D^{ix}**. The first column in the transition matrix marked “**static pool**” exhibits the *withdrawal-adjusted* static pool for the period.

- For instance, an entity / issuer continually rated from the middle of FY09 to the middle of FY14 would appear in the four consecutive one-year transition matrices from FY10 to FY13. It would not form part of the FY14 static pool, as the rating was not outstanding for the entire static pool period
- Likewise, all FY95 static pool members still rated at 11:59 PM on June 30, 2010, have 16 one-year transitions, while entities / issuers with outstanding ratings between 12:01 AM July 1, 2009, and 11:59 PM June 30, 2010 have only one

4.2.2 The transition matrix is constructed in the cohort method^x. The method considers the rating position at the beginning and end of a period *only*, excluding the dynamic process (*interim rating actions*) found within the period. Hence, it is limited in the sense that it loses considerable information, specially, in times of increased rating activity and suppresses migration trends. This limitation of the static pools can be overcome by increasing the frequency at which static pools are formed. Closer static pool spacing captures a greater number of rating changes and default events. In recent years, some international and regional rating agencies have adopted the practice of forming monthly static pools.

4.2.3 **Transition Rate Calculation:** Transition rates compare entity / issuer ratings at the beginning of a time period with ratings at the end of the period. An entity / issuer that remains rated for more than *one* period is counted *as many times* as the number of periods in which it is rated by PACRA.

4.2.4 Transition rates are *categorized* into:

- Upgrade rate
- Downgrade rate

4.2.5 These transition rates are calculated by the number of entities / issuers that experienced rating upgrades (downgrades) within the static pool period, divided by the total number of rated entities / issuers at the beginning of the static pool period, adjusted for withdrawals.

4.2.6 There may be several *varieties* of rating transitions. A description of these follows:

- i **One-Year Transition Matrix:** Each one-year transition matrix displays all rating movements between rating categories at the modifier level from the beginning of the year through year-end. For each rating listed in the matrix's left-most column, there are thirteen ratios listed in the rows, *corresponding* to the ratings from AAA to D and also an informational entry for withdrawn ratings WR.

		End-of-Year Rating (One-Year Transition – FY10)																
		%	Static Pool	WR	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB to B	CCC to C	D	Total
Beginning-of-Year Rating	One-Year FY10																	
	AAA	2	2		50.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	AA+	17	1	5.9%	88.2%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	AA	13	2	0.0%	7.7%	92.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	AA-	12	1	0.0%	8.3%	8.3%	83.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	A+	55	2	0.0%	0.0%	0.0%	0.0%	90.9%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	A	50	20	0.0%	0.0%	0.0%	0.0%	0.0%	90.0%	0.0%	4.0%	0.0%	0.0%	6.0%	0.0%	0.0%	0.0%	100.0%
	A-	48	2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	BBB+	75	25	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.3%	0.0%	0.0%	0.0%	0.0%	6.7%	100.0%
	BBB	21	4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	95.2%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	BBB-	20	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	BB to B	18	2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.8%	0.0%	22.2%	100.0%
	CCC to C	6	4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	33.3%	33.3%	100.0%

- For instance, one-year transition matrix (*below*) which corresponds to the FY10 static pool. shows that out of 70 A rated companies at the beginning

of that year, 20 of the entities / issuers were withdrawn during the year and the original static pool was adjusted by excluding the withdrawn ratings. The withdrawal-adjusted static pool, as exhibited in the transition matrix shows 50 outstanding ratings. Out of these, 90% were rated the same at year-end, while PACRA has downgraded 4% to BBB+ and 6% to BB - B categories. PACRA has not upgraded any of these ratings to a higher notch / category. This adds up to 100% of the transition for the A category

- ii Multi-year Transition Matrix: Multi-year transitions are also calculated. In this case, the rating at the beginning of the multi-year period is compared with the rating at the end. Otherwise, the methodology is *identical* to that used for single-year transitions.
 - For instance, the three-year transition matrix is the result of comparing ratings at the beginning of the year FY07 with the ratings at the end of the year FY09, *ignoring* all interim rating migrations in *between* the period (*beginning FY07 – end-FY09*)
- iii Average Transition Matrix: Average transition matrices (For instance, *an average transition of three one-year transitions; FY08, FY09, and FY10*) are calculated on the basis of both single-year and multi-year transition matrices just described. The idea is to “*smooth out*” periods of unusually high / low rating activity.

4.3 Default Rate Calculation

4.3.1 Withdrawal-adjusted default rates: PACRA computes withdrawal-adjusted default rates. The withdrawal-adjusted method of calculating default rates recognizes that there are three possible *end-of-period outcomes* for an outstanding rating: (i) default, (ii) survival, and (iii) rating withdrawal. As PACRA considers these three possible outcomes *mutually exclusive*, hence, entities / issuers that default and have their ratings withdrawn in the same time period are considered as defaults, not withdrawals. The same mechanics apply for a downgrade *followed* by a default within the same static pool period. These *two occurrences* would be counted as a default rather than a downgrade and a default.

4.3.2 PACRA computes the following varieties of default rates:

- i. Annual Default Rates (ADRs): An ADR reflects the *probability* that an entity / issuer that has survived in the static pool up to the beginning of a particular year will default by the end of the same year. Hence, an ADR captures the default rate on a *one-year investment horizon*. It is computed as the number of entities / issuers defaulting in a year as a proportion of the number of entities / issuers in the static pool at the beginning of the year, adjusted for withdrawals.
- ii. Marginal Average Default rates (MDRs): A MDR, on the other hand, reflects the *probability* that an entity / issuer that has survived in the static pool up to the beginning of a particular time interval, called measurement period, (*be it any time interval, a month, a year, two years*) will default by the end of that measurement period. A one-year MDR (MDR1) and an ADR is one and the same thing.
 - **For instance, taking into account the three-year measurement period FY07 – FY09:**
 - MDR1 reflects the *probability* that an entity / issuer that has survived in the static pool (C_0) up to the beginning of FY07 will default by the end of the year
 - MDR2 reflects the *probability* that an entity / issuer that has survived in the static pool (C_0) up to the beginning of FY08 will default by the end of FY08

- MDR3 reflects the *probability* that an entity / issuer that has survived in the static pool (C_0) up to the beginning of FY09 will default by the end of FY09

- iii. **Cumulative Average Default Rates (CDRs):** CDRs are calculated by compounding *constituent* MDRs. The time interval of a CDR is referred to as the measurement horizon. For instance, a three-year CDR (CDR-3) has a measurement horizon of three years and would take into account only those static pools that have been seasoned for three-years. A CDR reflects the probability of default from the time of pool formation up to and including the measurement horizon. The average cumulative default rate represents an estimate of expected cumulative default probabilities. It is calculated by taking the averages over many pool periods. This serves to capture the effects of several macroeconomic and credit cycle peaks and troughs^{xi}.

- For instance, if 2 entities defaulted in FY09 and 1 withdrawn, and the FY09 original static pool consisted of 100 entities / issuers at the beginning of the year, the resulting annual default rate for all ratings in FY09 would be 2.02% (2 / 99), adjusting the denominator for withdrawals
- For instance, a CDR-3 calculated for the last three years at the end of FY10 would include only one static pool, that of FY08 with three complete years of seasoning (FY08, FY09 and FY10). FY09 and FY10 have only been seasoned two and one year(s) respectively. Similarly a CDR-5 calculated for the last ten years at the end of FY10 would include six static pools, that of FY01, FY02, FY03, FY04, FY05 and FY06 with five complete years of seasoning. FY07, FY08, FY09 and FY10 pools have only been seasoned four, three, two and one year(s) respectively, hence, do not qualify for being included in the calculation of CDR-5. Furthermore, CDR-5 would reflect the probability of default of each constituent static pool from the time of its formation up to and including the subsequent five year time horizon
- **REFER TO ANNEXURE – Calculating Cumulative Average Default Rates**

4.3.3 PACRA's default rates are *entity / issuer-weighted* default rates, that is, they are calculated based on the number of entities / issuers rather than the Rupee amounts affected by defaults or rating changes. Although Rupee amounts provide information about the *portion of the market that is affected* by defaults or rating changes, issuer-weighted averages are considered by PACRA a more useful measure of the performance of ratings.

4.3.4 The Selective Default (SD) rating category is *counted as default* in calculating default statistics.

- i A sequel to the Credit Rating Companies Rules 1995 issued 17th February, 2005 by SECP – Section 2-e (p.2)
- iii Handbook on International Best Practices in Credit Rating, December 2008 (pp. 30-32; p.40)
- iii An economic cycle is a period during which a country's economy moves from strength to weakness and back to strength. This pattern repeats itself regularly, though not on a fixed schedule. The length of the cycle isn't predictable either and may be measured in months or in years – **Dictionary of Financial Terms**; Duration business cycles vary from more than one year to ten or twelve years - **Burns and Mitchell, 1946, p. 3**
- iv As per ACRAA, there is no “definition” of *WHAT* such a sample size would be
- v IOSCO *Code of Conduct Fundamentals for Credit Rating Agencies*, Section 3 -A-3.8 (p.9)
- vi See PACRA's Default Policy - “**What is Default?**” <http://www.pacra.com/>
- vii CRAs use either of the terms, static pools or cohorts as per their preference. Both the terms are interchangeable and synonyms of each other
- viii PACRA withdraws ratings when: (i) the rating relationship is terminated at the client’s request or made to terminate by PACRA on account of a lack of cooperation, particularly at a time when the company is experiencing financial distress and refuses to provide all the information needed to continue surveillance on the ratings, (ii) when an entity ceases to exist as a result of a merger / acquisition, and (iii) when a debt instrument reaches maturity and is fully redeemed. As per PACRA Policy, entity ratings, put on the default counter (whether **D** or **SD**), remain under surveillance on a best-effort basis and updated using both public and non-public sources, till the time (i) and / or (ii), as mentioned above, occurs. An entity rating, *hence withdrawn*, marks the end of the rating relationship with PACRA. Thereafter, a fresh rating mandate is agreed in order for entity ratings to be assigned. Instruments, assigned a **D** rating, remain under surveillance (*till fully settled*) and are updated using both public and non-public sources, on a best effort basis
- ix Subsequent Withdrawal from D category is recorded as default and not withdrawal by PACRA as explained in Section 6.1.3
- x The cohort method is based on Jafry and Schuermann (2004) work. It offers a simple estimation process. However, the method has a very rigid assumption that time is discrete; therefore, rating activity cannot be analyzed holistically. The method considers the rating position at the beginning and end of a period only, excluding the dynamic process found within the period in the form of interim rating actions
- xi PACRA derives its methodology for calculating CDRs using Moody's discrete-time hazard rate method

SELECTED REFERENCES:

- i *Fitch Ratings Global Corporate Finance 2009 Transition and Default Study*, **March, 2010**, Fitch Ratings
- ii *Corporate Default and Recovery Rates, 1920-2009*, **February 2010**, Moody’s
- iii *The Performance of Moody's Corporate Debt Ratings*, **March 2010**, Moody’s
- iv *Default, Transition, and Recovery: 2009 Annual Asian Corporate Default Study And Rating Transitions*, **May 2010**, Standard & Poor’s
- v *Industry Study: 2008 DBRS Corporate Rating Transition and Default Study*, **March 2009**, DBRS
- vi *DEFAULT AND RATING TRANSITION STUDY (1992-June 2009)*, **November 2009**, RAM Ratings
- vii CRISIL RATINGS Insight in Risk Publication *CRISIL Default Study*, **2009**

Analysts	Humaira Jamil +92 42 3586 9504 humaira@pacra.com	Shahzad Saleem +92 42 3586 9504 shahzad@pacra.com
-----------------	--	---

Disclaimer:
 PACRA has used due care in preparation of this document. Our information has been obtained from sources we consider to be reliable but its accuracy or completeness is not guaranteed. PACRA shall owe no liability whatsoever to any loss or damage caused by or resulting from any error in such information. None of the information in this document may be copied or otherwise reproduced, stored or disseminated in whole or in part in any form or by any means whatsoever by any person without PACRA’s written consent. Our reports and ratings constitute opinions, not recommendations to buy or to sell

1. Computing Cumulative Average Default Rates (CDRs)
 - A useful measure to track defaults

1.1 The *basis* for calculating cumulative average default rates (**CDRs**) is the marginal default rates (**MDRs**). Depending upon the *time-intervals* to be covered by the CDR, the *first step* is to calculate MDRs for each *successive* time interval. The MDRs then require *averaging* across similar time intervals and weighed by the size of the *withdrawal-adjusted static pool* to reach weighted average MDRs (**WMDRs**) for each time interval. These WMDRs are then **chain-linked** into survival rates and *subtracted* from one (1) to get the CDR for a particular time interval.

1.2 The **computation of three (3) year CDR (CDR-3)** for the *last four years* at the end of *FY10 (June 30, 2010)* passes through the following *schematic* steps:

STEP 1: Selecting the appropriate static pools¹ for CDR-3

Which Static Pools ¹ are to participate in calculating CDR-3		
Static pools (For last four years)	Static pool Notation	Status
FY07 static pool	C ^{FY07}	Included
FY08 static pool	C ^{FY08}	Included
FY09 static pool	C ^{FY09}	Excluded as these two static pools have not experienced three years of seasoning
FY10 static pool	C ^{FY10}	

STEP 2: Calculate MDRs for each static pool (included) separately

MDRs for C^{FY07}

$$MDR1^{FY07} = \frac{\text{Defaults in FY07 out of } C^{FY07}}{C^{FY07} - W_{CFY07}^{FY07}}$$

MDR1^{FY07} = Marginal Default Rate for Year 1 of CDR-3

W^{FY07}_{CFY07} = Withdrawals in FY07 out of C^{FY07}

$$MDR2^{FY07} = \frac{\text{Incremental Defaults in FY08 out of } C^{FY07}}{(C^{FY07} - W_{CFY07}^{FY07} - W_{CFY07}^{FY08}) * (1 - MDR1^{FY07})}$$

MDR2^{FY07} = Marginal Default Rate for Year 2 of CDR-3

W^{FY08}_{CFY07} = Withdrawals in FY08 out of C^{FY07}

$$MDR3^{FY07} = \frac{\text{Incremental Defaults in FY09 out of } C_{FY07}}{(C^{FY07} - W_{CFY07}^{FY07} - W_{CFY07}^{FY08} - W_{CFY07}^{FY09}) * (1 - MDR1^{FY07}) * (1 - MDR2^{FY07})}$$

MDR3^{FY07} = Marginal Default Rate for Year 3 of CDR-3

W^{FY09}_{CFY07} = Withdrawals in FY09 out of CFY07

¹ Original (*withdrawal-unadjusted*) static pools are to be considered here, that are later on adjusted for withdrawals

MDRs for C^{FY08}

$$MDR1^{FY08} = \frac{\text{Defaults in FY08 out of } C^{FY08}}{(C^{FY08} - (W^{FY08}_{CFY08}))}$$

MDR1^{FY08} = Marginal Default Rate for Year 1 of CDR-3

W^{FY08}_{CFY08} = Withdrawals in FY08 out of CFY08

$$MDR2^{FY08} = \frac{\text{Incremental Defaults in FY09 out of } C^{FY08}}{(C^{FY08} - W^{FY08}_{CFY08} - W^{FY09}_{CFY08}) * (1 - MDR1^{FY08})}$$

MDR2^{FY08} = Marginal Default Rate for Year 2 of CDR-3

W^{FY09}_{CFY08} = Withdrawals in FY09 out of C^{FY08}

$$MDR3^{FY08} = \frac{\text{Incremental Defaults in FY10 out of } C^{FY08}}{(C^{FY08} - W^{FY08}_{CFY08} - W^{FY09}_{CFY08} - W^{FY10}_{CFY08}) * (1 - MDR1^{FY08}) * (1 - MDR2^{FY08})}$$

MDR3^{FY08} = Marginal Default Rate for Year 3 of CDR-3

W^{FY10}_{CFY08} = Withdrawals in FY10 out of C^{FY08}

STEP 3: Compute WMDRs for each time interval

Static Pools	Sets of MDRs (As calculated in STEP 2)		
C ^{FY07}	MDR1 ^{FY07}	MDR2 ^{FY07}	MDR3 ^{FY07}
C ^{FY08}	MDR1 ^{FY08}	MDR2 ^{FY08}	MDR3 ^{FY08}

WMDR1 = Weighted Average MDR for Year-1

WMDR2 = Weighted Average MDR for Year-2

WMDR3 = Weighted Average MDR for Year-3

$$WMDR1 = \frac{[MDR1^{FY07} * (C^{FY07} - W^{FY07}_{CFY07})] + [MDR1^{FY08} * (C^{FY08} - W^{FY08}_{CFY08})]}{(C^{FY07} - (W^{FY07}_{CFY07})) + (C^{FY08} - (W^{FY08}_{CFY08}))}$$

$$WMDR2 = \frac{[MDR2^{FY07} * (C^{FY07} - W^{FY07}_{CFY07} - W^{FY08}_{CFY07})] + [MDR2^{FY08} * (C^{FY08} - W^{FY08}_{CFY08} - (W^{FY09}_{CFY08}))]}{(C^{FY07} - W^{FY07}_{CFY07} - (W^{FY08}_{CFY07})) + (C^{FY08} - W^{FY08}_{CFY08} - (W^{FY09}_{CFY08}))}$$

$$WMDR3 = \frac{[MDR3^{FY07} * (C^{FY07} - W^{FY07}_{CFY07} - W^{FY08}_{CFY07} - W^{FY09}_{CFY07})] + [MDR3^{FY08} * (C^{FY08} - W^{FY08}_{CFY08} - W^{FY09}_{CFY08} - W^{FY10}_{CFY08})]}{(C^{FY07} - W^{FY07}_{CFY07} - W^{FY08}_{CFY07} - W^{FY09}_{CFY07}) + (C^{FY08} - W^{FY08}_{CFY08} - W^{FY09}_{CFY08} - W^{FY10}_{CFY08})}$$

STEP 4: Computation of CDR-3

$$CDR-3 = 1 - [(1-WMDR1)*(1-WMDR2)*(1-WMDR3)]$$

1.3 A numerical example illustrates the computation of CDR-3:

NUMERICAL EXAMPLE: Calculating CDR-3 for the last three years at the end of FY10

Relevant static pool	Ratings outstanding (As on static pool formation date) (July 1, 2007)
C^{FY08}	$C_0 = 100$

STEP 1: Data input for Original static pool C^{FY08} for each year covered by this CDR-3

Year	Defaults	Withdrawals
FY08	$D^{FY08}_{CFY08} = 2$	$W^{FY08}_{CFY08} = 7$
FY09	$D^{FY09}_{CFY08} = 1$	$W^{FY09}_{CFY08} = 8$
FY10	$D^{FY10}_{CFY08} = 1$	$W^{FY10}_{CFY08} = 10$

STEP 2: Calculating: (i) Withdrawal-adjusted static pool
(ii) Survivors at risk of default (SRD)

Year	Withdrawal adjusted static pool	Survivors at the risk of default (SRD)
FY08	$C_1 = C_0 - W^{FY08}_{CFY08}$ $= 100 - 7 = 93$	$SRD_1 = C_1$ $= 93$
FY09	$C_2 = C_0 - W^{FY08}_{CFY08} - W^{FY09}_{CFY08}$ $= 100 - 7 - 8 = 85$	$SRD_2 = C_2 * S_1^*$ $= 85 * 97.85\% = 83.20$
FY10	$C_3 = C_0 - W^{FY08}_{CFY08} - W^{FY09}_{CFY08} - W^{FY10}_{CFY08}$ $= 100 - 7 - 8 - 10 = 75$	$SRD_3 = C_3 * S_1^* * S_2$ $= 75 * 97.85\% * 98.80\% = 72.50$

*S = Survivors (to be calculated in STEP 3 NEXT)

STEP 3: Calculating: (iii) MDRs, (iv) Survivors (S)

Year	MDRs	Survivors (S)
FY08	$MDR1^{FY08} = D_{CFY08}^{FY08} / SRD_1$ = 2 / 93 = 2.15%	$S_1 = 1 - MDR1^{FY08}$ = 100% – 2.15% = 97.85%
FY09	$MDR2^{FY08} = D_{CFY08}^{FY09} / SRD_2$ = 1 / 83.2 = 1.20%	$S_2 = 1 - MDR2^{FY08}$ = 100% – 1.20% = 98.80%
FY10	$MDR3^{FY08} = D_{CFY08}^{FY10} / SRD_3$ = 1 / 72.50 = 1.38%	$S_3 = 1 - MDR3^{FY08}$ = 100% – 1.38% = 98.62%

STEP 4: Calculating: (v) CDR-3

PLEASE NOTE: Since CDR-3 is based on only one static pool, **MDRs = WMDRs**

$$CDR-3 = 1 - [(1-WMDR1^{FY08}) * (1-WMDR2^{FY08}) * (1-WMDR3^{FY08})]$$

$$= 100\% - [97.85\% * 98.80\% * 98.62\%] = \mathbf{4.66\%}$$

Analysts	Humaira Jamil +92 42 3586 9504 humaira@pacra.com	Shahzad Saleem +92 42 3586 9504 shahzad@pacra.com
-----------------	---	--

Disclaimer:

PACRA has used due care in preparation of this document. Our information has been obtained from sources we consider to be reliable but its accuracy or completeness is not guaranteed. PACRA shall owe no liability whatsoever to any loss or damage caused by or resulting from any error in such information. None of the information in this document may be copied or otherwise reproduced, stored or disseminated in whole or in part in any form or by any means whatsoever by any person without PACRA's written consent. Our reports and ratings constitute opinions, not recommendations to buy or to sell