MOODY'S INVESTORS SERVICE

SECTOR IN-DEPTH

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Default Research

Default and Recovery Rates for Project Finance Bank Loans, 1983-2015

This study is an update to the previous study published by Moody's Investors Service in March 2016 examining the default and recovery performance of unrated project finance bank loans. The study data set is 9% larger than in our March 2016 report and now accounts for some 62% of all project finance transactions originated globally during a 33 year period from 1 January 1983 to 31 December 2015. Our findings, which are based on a data set from a consortium of leading project finance lenders and investors, are similar to last year's report but for the first time include the impact of a project's location on its credit performance, based on the World Bank Group's Country Classification.

» **The 10-year cumulative default rate for unrated project finance bank loans is 6.7%.** The rate is consistent with the 10-year cumulative default rate for corporate issuers of low investment-grade credit quality and with the rate reported in last year's study (6.4%).

» **Marginal annual default rates are consistent with marginal default rates of high speculative-grade credits in the first three years**. However, they trend towards marginal default rates that are consistent with single A category corporate ratings by year seven from financial close.

» **Ultimate recovery rates for project finance bank loans average 79.5%.** However, the most likely ultimate recovery rate is 100% - that is, there is no economic loss - the outcome in almost two-thirds of cases. This observation is consistent with last year's study.

» **Project jurisdiction matters in the initial years of a project**. Jurisdiction tends to be a less critical driver of default rates once a project has started to build an operating track record. Average ultimate recovery rates show a degree of variation by World Bank Group Country Classification, but do not show significant variation when segmented by the broader classification of OECD and non-OECD countries.

» **Infrastructure projects and PPP (Public-Private-Partnership) projects experienced an increase in the 10-year cumulative default rate compared to the previous study**. Both sectors have a lower cumulative default rate than the study sector average, but the cumulative default rate for PPP projects increased to 5.2% (Basel II) from 3.9% cited in the previous study and for all infrastructure projects to 5.8% (Basel II) from 4.7% as the larger dataset added additional default counts to 2015 and 2014.

» Ultimate recovery rates for construction-phase defaults are lower than ultimate recovery rates for operation-phase defaults.

» On average, ultimate recovery rates realized through work-outs exceed ultimate recovery rates achieved through distressed sale exits.

THIS REPORT WAS REPUBLISHED ON 21 MARCH 2017 WITH A CORRECTION TO THE SECOND PARAGRAPH IN SECTION 8.8 ON PAGE 44. THE WORD "LOWER" WAS REPLACED WITH THE WORD "GREATER".

1. Update to This Year's Study

The Study updates and expands the scope of research that we have previously published on the historical default and recovery performance of unrated project finance bank loans, most recently in March 2016. The data presented in this Study is sourced from the Data Consortium which is managed by Moody's Analytics. All analytics and statistics are compiled by Moody's Analytics on behalf of Moody's Investors Service; all market and industry commentary has been prepared by Moody's Investors Service. For further information see the Notice re Data Consortium on page 74 of this report. We wish to acknowledge and thank each of the financial institutions in the Data Consortium for supporting and contributing to the Study.

This Study includes slight adjustments to the dataset and our methodology that we outline below. Importantly, our findings from the current study are broadly consistent with the March 2016 study. However, for the first time, this year's Study includes the impact of a project's location on its credit performance, based on the World Bank Group's Country Classification, which classifies countries in different groups according to their income level. A more detailed description of the World Bank Group Country Classification is included in Appendix B (Glossary).

The Study Data Set now comprises 6,389 projects, which account for 62.0% of all project finance transactions originated globally during a 33 year period from 1 January 1983 to 31 December 2015. The Study Data Set continues to be substantially representative of industry-wide project finance activity by year of origination, by industry sector and by regional concentration.

The Study uses the Basel II[1] definition of default (BII).[2] Based on this definition the Study Data Set includes 460 projects for which at least one senior secured project finance bank loan has defaulted. Of these 460 defaulted projects, 237 have subsequently emerged from default.[3] The Study also applies Moody's definition of default (Moody's), according to which the Study Data Set contains 363 defaults, of which 209 have subsequently emerged from default. We discuss the differences between these default definitions in Section 4.2.

Terminology: In certain instances we use suffix notation to clarify whether information is presented based on the Basel II definition of default (BII) or Moody's definition of default (Moody's).

Occasionally the Study Data Set provided by the Data Consortium will include reclassification of data points, the discovery of historical defaults or new information about recoveries leading to minor changes in the historical data. In addition, as the data set for this study is 9% larger than last year's study, the results based on a different data set will necessarily show some degree of variation. As always, the findings reported in the most recently published study supersede those from the previous study.

In terms of classifying the data by region, we note that we have reclassified countries previously categorized as Southeast Asia as Asia.

As part of the Study, we derived historical default rates for project finance bank loans and compared these against historical default rates for corporate bond and loan issuers rated by Moody's. We also compare the recovery behavior of project finance bank loans to the recovery behavior of a data set

[1] "International Convergence of Capital Measurement and Capital Standards: A Revised Framework (Comprehensive Version: June 2006)" published by the Basel Committee on Banking Supervision at http://www.bis.org/publ/bcbs128.htm (the "**Basel II Framework**", or "**Basel II**")

[2] We reproduce the Basel II definition of default in Appendix B (Glossary).

[3] Emergence criteria are described more fully in Section 4.3 (Recovery Analysis).

comprising corporate bank loans (predominantly senior secured debt facilities) derived from Moody's Ultimate LGD Database.[4]

We have received extensive feedback in response to our previous research, and continuously seek to expand and update the Study Data Set. While the Study reports on the historical performance of unrated project finance bank loans, we also highlight our Special Comment "Infrastructure Default and Recovery Rates, 1983-2015", which reports on the historical performance of Moody's-rated long-term infrastructure debt (see Appendix E).

2. Summary of Key Findings

We highlight and discuss below our key findings based on the Study Data Set. The Study Data Set is 9% larger than that considered in the March 2016 study, containing 509 additional projects and 35 more defaults (BII). The results of this Study and the March 2016 study are largely consistent and the findings of the Study continue to suggest that the risk allocation, structural features, underwriting disciplines and incentive structures which characterize the project finance asset class have proven effective.

Key findings for the Study Data Set as a whole:

» Cumulative annual default rates:

- The 10-year cumulative default rate for project finance bank loans is consistent with the 10-year cumulative default rates for corporate issuers of low investment grade credit quality (see Exhibit 13).
- The 10-year cumulative default rate for the Study Data set as a whole is 6.7% (BII), consistent with the 6.4% (BII) reported in the previous March 2016 study (see Exhibit 13).

» Marginal annual default rates:

- Marginal annual default rates for project finance bank loans show certain characteristics that distinguish them from corporate finance bonds and loans: Marginal default rates fall over time and trend towards marginal default rates consistent with the single-A rating category by year seven from financial close. They are consistent with high speculative grade credit quality during an initial three year period following financial close. In comparison, marginal default rates for corporate bank loans show greater stability over time (see Exhibit 15).
- The decline in marginal annual default rates over time suggests that the default risk of a project declines as construction is completed and the project starts to build its operating track record.

» Ultimate Recovery Rates:

- Ultimate recovery rates for project finance bank loans are similar to ultimate recovery rates for senior secured corporate bank loans.
- Ultimate recovery rates for project finance bank loans averaged 79.5% (BII) and 77.3% (Moody's), largely consistent with last year's study findings. The most likely ultimate recovery rate remains 100% ((BII) and (Moody's)) – no economic loss – seen in over 60% of the cases (see Exhibit 33).

[4] Moody's proprietary database which contains information on over 5,200 defaulted loans and bonds taken from 1,000+ non-financial US corporations that initially defaulted between 1987 and 2015.

- Ultimate recovery rates for construction phase defaults averaged 70.2% (BII) and 70.3% (Moody's), modestly lower than ultimate recovery rates for operation phase defaults, which averaged 81.2% (BII) and 78.7% (Moody's) (see Exhibit 40).
- Ultimate recovery rates realized through a work-out process, of 79.5% (BII) and 77.3% (Moody's) substantially exceed average recovery rates achieved through distressed sale exits, of 49.8% (BII) and 48.4% (Moody's) (see Exhibit 33).
- Average ultimate recovery rates (BII) for project finance bank loans emerging from default during 1999-2014 were in the range of 70.4%-100%. Data for 2015 is based on only one recovery count with an ultimate recovery rate of 37.6%, which was exceptionally low. In addition, in 2013, the average ultimate recovery rate was also exceptionally low at 49.6%. Other than 2013 and 2015, average ultimate recovery rates in 1999-2014 show substantial independence from the incidence of defaults and from the incidence of projects emerging from default (see Exhibit 36).

» Findings by region:

- The three most significant regions are North America, Western Europe and Asia, accounting for 77.0% of total defaults (see Exhibit 9).
- Cumulative annual default rates and simple average annual default rates show a variation by region. Classification of the data set by World Bank Group Country Classification suggests that project jurisdiction matters in the initial years of a project. Jurisdiction tends be a less critical driver of default risk once a project has started to build an operating track record. 10-year cumulative default rates (BII) are highest in lower-middle-income economies (10.2%); followed by upper-middle-income economies (7.5%) and high-income economies (6.5%). Classification by OECD (6.5%) and non-OECD (7.7%) countries shows limited variation (see Exhibit 21).
- The Study Data Set reveals no clear indication if project jurisdiction has a material impact on project finance bank loan recovery rates. Average ultimate recovery rates show a degree of variation by World Bank Group Country Classification, with lower-middle-income economies having a recovery rate of 72.0% (BII), modestly below the Study Data average of 79.5% (BII). At the same time, recovery rates (BII) do not show significant variation when segmented by the broader classification of OECD and non-OECD countries (see Exhibit 38).

» Findings by industry (Note: Publication of certain analysis has been withheld at the request of the Data Consortium):

- The three most significant industry sectors are Power, Infrastructure, and Oil & Gas, accounting for 73.3% of total defaults (BII) (see Exhibit 10).
- Infrastructure: The infrastructure sector continued to experience significant stress in the period 2009-2015. The study data set includes 84 defaults in the period 2009-2015, which represents 75.7% of total infrastructure defaults during the period 1990-2015 included in the study data set. The 10-year cumulative default rate for the Infrastructure industry sector is 5.8%, better than the study average of 6.7%, but higher than the 4.7% rate reported in the March 2016 Study.
- Power: The Power sector experienced significant stress during the 2001-2004 period, representing 18% of all 460 defaults (BII) in the Study Data Set. The 10-year cumulative default rate of the Power sector is close to the study average.
- Oil & Gas: The Oil & Gas sector experienced significant stress during the period 2008-2010. The study data set includes 55 defaults (BII) in the Oil & Gas sector of which around 40%

occurred in the period 2008-2010. The 10-year cumulative default rate (BII) for the Oil & Gas industry sector is below the study average.

- **Average ultimate recovery rates differ between industries.** In particular, the data shows a divergence of average ultimate recovery rates between industry sectors, within a range of 60.0% to 100.0% (see Exhibit 39).

» Findings for PPP/P3 projects:

- The Study Data Set contains 1,525 projects classified as PPP/P3 (Public-Private-Partnership) projects, a discrete sub-sector which remains at the low risk end of the project finance spectrum, despite an increase in the cumulative default rate compared to the previous study.
- The 10-year cumulative default rate (BII) is 5.2%, an increase from the 3.9% rate reported in the March 2016 study. The 10-year cumulative default rate remains modestly lower than for the Infrastructure industry sector of 5.8%, and lower than the 10-year cumulative default rate (BII) for the total Study Data Set of 6.7%.
- Marginal annual default rates (BII) are borderline investment grade, falling in between the Baa and Ba rating category, for the initial years post financial close. They decline thereafter to marginal annual default rates consistent with those of corporate issuers in the Baa rating category by year six from financial close and trend towards the single A rating category after year seven from financial close.
- The average ultimate recovery rates are 85.5% (BII) and 81.8% (Moody's), slightly above ultimate recovery rates of 79.5% (BII) and 77.3% (Moody's) observed for the Study Data Set as a whole.
- Notably, there is some subjectivity in the classification of projects as PPP/P3 projects and the number of defaults (77 (BII) and 43 (Moody's)) remains relatively small.

3. Overview of the Project Finance Industry

Project and infrastructure financings encompass a broad range of asset types and are often used to fund the development of capital intensive assets such as energy, natural resources, social infrastructure, economic infrastructure, e.g. airports, and the provision of associated public services. Infrastructure assets and services tend to benefit from robust or inelastic demand, which supports the stability and predictability of long-term revenues.

McKinsey Global Institute estimated in a June 2016 report that the world invests around $2.5 trillion a year in transportation, power, water, and telecom systems which still falls short of the projected economic infrastructure investment needed to support expected economic growth, of on average $3.3 trillion a year for the period from 2016 through 2030.

Exhibit 1 shows the population of all project finance transactions originated from 1 January 1983 – 31 December 2015, based on industry data provided by Thomson Reuters Project Finance International (the Industry Data Set). Total debt raised for global project finance transactions reached around $279 billion in 2015, around 11% above the pre-financial crisis 2008 peak.

EXHIBIT 1

Profile of the Industry Data Set by Origination Year

Year of Financial Close	Debt Raised (US$ Billions)	Number of Projects
1983	3.7	28
1984	2.2	23
1985	1.3	10
1986	2.5	11
1987	11.0	16
1988	1.1	8
1989	0.6	5
1990	8.6	23
1991	8.5	31
1992	15.4	70
1993	26.2	118
1994	29.0	118
1995	23.3	156
1996	42.8	192
1997	67.4	281
1998	56.7	239
1999	72.4	239
2000	110.9	450
2001	108.5	314
2002	62.2	298
2003	69.6	323
2004	117.8	471
2005	136.3	512
2006	183.8	552
2007	228.3	644
2008	251.2	714
2009	140.2	475
2010	213.9	620
2011	221.1	641
2012	206.3	581
2013	204.9	596
2014	261.9	721
2015	278.8	800
Industry Total	**3,168.2**	**10,280**

Note: For consistency with the Study Data Set, the Industry Data Set from Thomson Reuters references projects reaching financial close in the period 1 January 1983 - 31 December 2015.

Source: Thomson Reuters Project Finance International, Moody's Analytics Project Finance Data Consortium

The Study Data Set accounts for approximately 62% of the larger Thomson Reuters Industry Data Set from 1983-2015. Correlations between the two data sets are very high – correlation by year of origination is around 95%, correlation by region is around 90%, and correlation by industry sector is in excess of 99%. We conclude therefore that the Study Data Set is substantially representative of

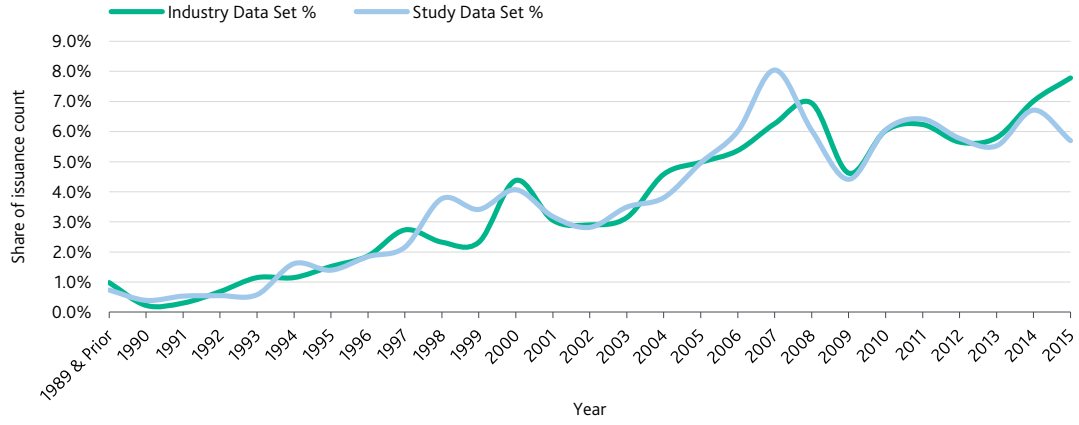
industry-wide project finance activity by year of origination, by industry sector and by regional concentration.

Differences in concentrations by year, region and industry are the result of the different client relationships, loan origination strategy, and geographic and industry focus of each participant in the Data Consortium. They also reflect potential differences in the classification of individual projects by year of origination, by industry and by region. For example, lenders providing information for the same project may not always be consistent in their classification of industry and region. Moreover, consortium participants that bought loan participations after financial close may have reported different origination dates from the date on which financial close occurred. Where possible, we have verified and corrected inconsistencies between data submitted by multiple lenders for the same project. However, we have not been able to cross-check data where that data was only submitted by a single lender.

Exhibit 2 compares the Study Data Set and the Thomson Reuters Industry Data Set by year of project origination.

EXHIBIT 2

Comparison of Study Data Set and Industry Data Set by Year of Project Origination



Source: Moody's Analytics Project Finance Data Consortium

The correlation between the two data sets by year of origination is around 95%. As discussed further in Sections 5.1 and 5.2 below, similar high correlations also exist between the regional concentrations and the industry concentrations of the two data sets.

3.1 Characteristics of Project Finance

Project finance refers to the financing of long-term infrastructure, industrial or public assets and services using limited recourse long-term debt raised by an enterprise operating in a focused line of business in accordance with contractual agreements. Project financings are based on the notion that risks in the transaction are identified upfront, allocated to transaction parties best able to manage those risks and mitigated such that residual risks are acceptable to funders.

A typical project finance structure has many of the following elements, including the use of a special or single purpose entity or project company to raise non-recourse debt which is serviced and repaid from the net cash flows generated by the project. The scope of the project, its financing arrangements and the security interests granted to secured debt providers are set out in comprehensive contractual arrangements entered into by the project company. These contractual arrangements limit the project's activities so that lenders can assess the project's initial construction and long-term business and

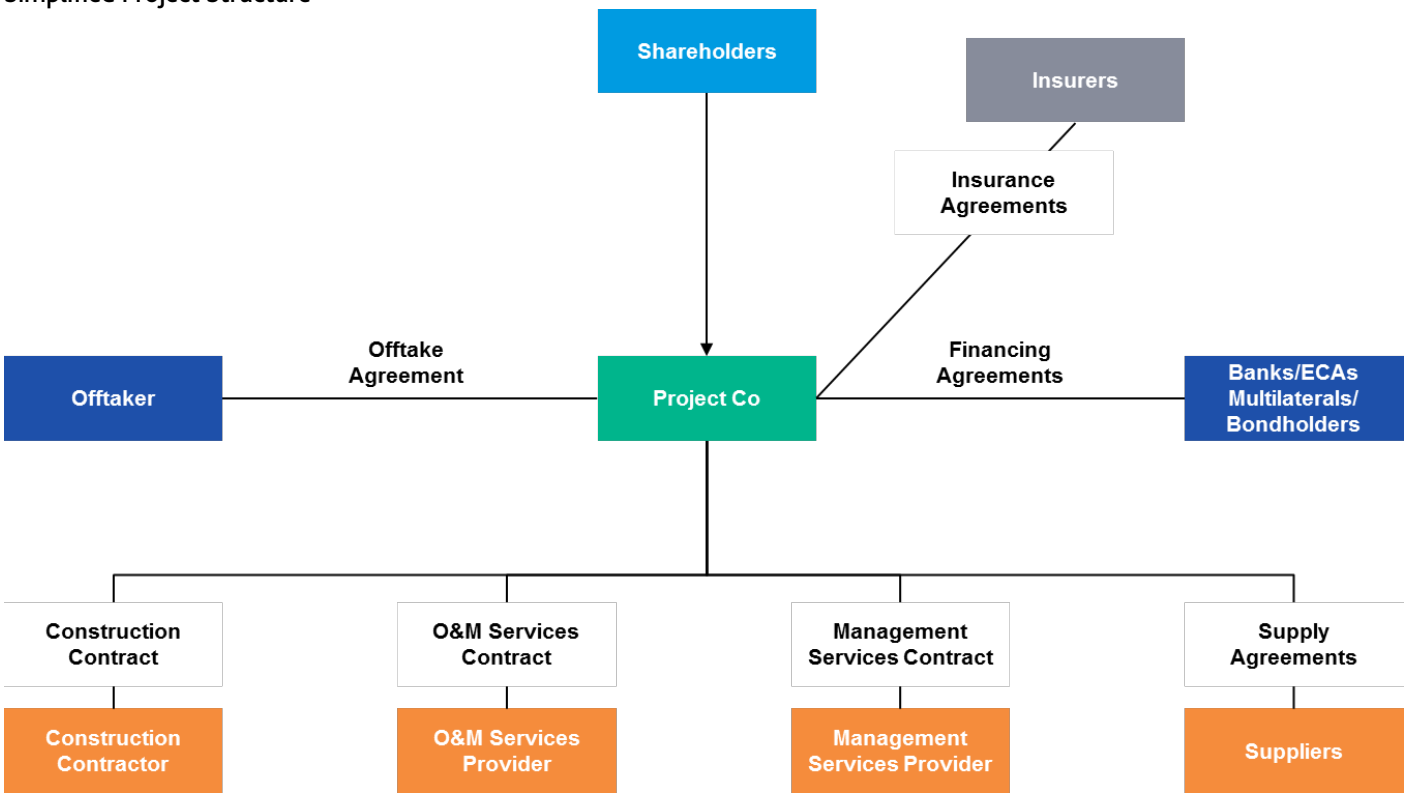
operating risks. This assessment is fundamental to each project financing, given that they typically have higher debt levels compared to other non-financial corporates.

Project finance transactions with lower credit risk tend to benefit from long term contracts providing predictable revenues from creditworthy counterparties and limited competition. At the other end of the spectrum are projects that have a weak economic or competitive position, face uncertain net cash flows given exposure to market risk, may use complex technologies and/or may have weak counterparties.

There is a continuum between project finance entities and other infrastructure corporates. These fundamental differences include the numerous limitations a project's financial covenants place on the project's operations, such as limited recourse to the project sponsors' other assets, limitations on business activity, limitations on additional debt issuance, shareholder distributions, maintenance of reserves, asset sales or purchases, and changes in control, etc. Project finance senior debt facilities are typically structured to be robust to potentially severe risks, including significant macroeconomic and performance stresses.

The Study Data Set comprises project finance bank loans which fall within the Basel II definition of Project Finance. For reference, we reproduce the Basel II definition of Project Finance in Appendix B (Glossary). Exhibit 3 shows a simplified project structure. The contracts between the project company (Project Co) and parties such as the offtaker,[5] construction contractor, feedstock supplier, fuel supplier and other parties are structured to mitigate the risks retained by the project company itself.

EXHIBIT 3
Simplified Project Structure



Source: Moody's Investors Service

[5] The recipient of the end product of the project.

We comment further in Appendix C (Overview of Project Finance Characteristics) on the typical features found in project finance transactions that mitigate default risk and loss given default.

4. Data and Methodology

4.1 Study Data Set

The data presented in this Study is sourced from the Data Consortium which is managed by Moody's Analytics. All analytics and statistics are compiled by Moody's Analytics on behalf of Moody's Investors Service; all market and industry commentary has been prepared by Moody's Investors Service. For further information see the Notice re Data Consortium on page 74 of this report.

The Study Data Set comprises 6,389 distinct projects originated between 1 January 1983 and 31 December 2015.

4.2 Default Analysis

The calculation of default rates is dependent on the definition of default adopted. At the request of the Data Consortium, the Study analyzes the historical behavior of project finance bank loans using the Basel II definition of default. For reference, we have also included comparable results based on Moody's definition of default. We reproduce the Basel II definition of default as well as our definition of default in Appendix B (Glossary).

The Basel II definition of default captures a wider range of defaults, including circumstances in which the reporting bank considers that the obligor is unlikely to pay its credit obligations in full. For example, under the Basel II definition, defaulted credits would also include debt obligations where (1) the bank puts the credit obligation on non-accrued status; or (2) the bank makes a charge-off or account-specific provision resulting from a significant perceived decline in credit quality subsequent to the bank taking on the exposure.

While the default of a single project finance debt facility occurs at the instrument level, we present default rate analysis in this Study on the basis of the number of projects for which at least one senior secured project finance bank loan has defaulted.[6] References in the Study to a "project default" should be construed accordingly.

The Basel II default date was used under the Basel II definition of default, whereas the actual payment default date was used under our definition of default. In some cases the Basel II default date was the same as the payment default date or bankruptcy date.

Based on the Basel II definition of default, the Study Data Set contains 460 distinct projects that defaulted (each a default (BII)), comprising:

» 172 defaults (BII) still in the work-out process (each a default in work-out (BII))

» 51 defaults (BII) for which recoveries have been realized following a distressed sale of the relevant defaulted loan participation (each a Distressed Sale (BII))

[6] This avoids the potential distortion arising from the calculation of facility-weighted defaults rates, where the number of facilities per project is arbitrary. Furthermore, while a default would necessarily occur at the instrument level, under typical project finance intercreditor arrangements it is likely that the instrument level default (if not remedied or waived) would lead to a cross-default of the other pari passu senior secured project finance debt facilities raised by that project borrower.

» 237 defaults (BII) for which recoveries have been realized following emergence from default [7] (each an Ultimate Recovery (BII))

The default rates in the Study are calculated based on the entire population of 460 defaults (BII), whereas the calculation of ultimate recovery rates are based on the population of 237 Ultimate Recoveries (BII).

The 172 Defaults In Work-Out (BII) are not included in the recovery analysis in the Study. However, as defaulted credits are resolved either through distressed sale exits or through emergence from default, we anticipate that additional information will be made available to us for inclusion in an expanded and updated data set.

Based on our definition of default, the Study Data Set contains 363 distinct projects that defaulted (each a default (Moody's)), comprising:

» 116 defaults (Moody's) still in the work-out process (each a default in work-out (Moody's))

» 38 defaults (Moody's) for which recoveries have been realized following a distressed sale of the relevant defaulted loan participation (each a distressed sale (Moody's))

» 209 defaults (Moody's) for which recoveries have been realized following emergence from default (each an Ultimate Recovery (Moody's))

The 116 defaults In Work-Out (Moody's) are not included in the recovery analysis in the Study.

4.3 Recovery Analysis

The calculation of recovery rates is dependent on the definition of emergence from default adopted. The Study uses the definition of emergence from default set out below.

For the reasons set out in Section 4.3.1 below, recovery analysis is based on the assumption that all pari passu senior secured debt facilities for a single project would share the same average recovery rate. However, in validating this assumption we have evaluated recoveries on a facility level.

Emergence From Default:

For a loan that has defaulted, emergence from default is deemed to occur following any of the events set out below:

» Repayment of overdue interest

» Restructuring with no subsequent default

» Restructuring with the lender being taken out of the deal – for example, by repayment of the defaulted loan with no participation in a restructured debt facility

» Material restructuring

» Liquidation

Ultimate recovery values are determined for each loan that has emerged from default based on the emergence criteria listed above, calculated as at the last date on which cash was paid prior to default. Cash flows arising post default such as interest payments, principal repayments, other cash payments or receipts[8] or asset-value recoveries, excluding recoveries under any political risk insurance

[7] Emergence criteria are described more fully in Section 4.3 (Recovery Analysis).

[8] For example, other cash payments would include legal fees; other cash receipts would include default interest.

arrangements or any guaranty arrangements, are discounted to the last date on which cash was paid prior to default at the pre-petition interest rate implicit in the loan at the time of its default. In some instances, for example for a loan that has emerged from default following the repayment of overdue interest, it is possible for a separate default to occur subsequent to emergence from the initial default. In such instances of serial default, only a single default is deemed to have occurred for which the ultimate recovery value is determined with reference to the initial default. The ultimate recovery rate for a loan that has emerged from default is determined by dividing the ultimate recovery value by the principal outstanding at the date of default.

The definition of emergence from default set out above specifically excludes exits which individual lenders may have executed via the distressed sale of relevant loan participations. Although distressed sales are a common exit route for lenders seeking early resolution of defaulted credits, the timing and value of such exits may differ significantly between lenders exiting from the same defaulted loan, and do not necessarily predict the loan's ultimate recovery value. The recovery value for a distressed sale (i.e., a distressed sale exit) is determined in a similar manner to that described above, including the disposal proceeds within post default cash flows. The recovery rate for a distressed sale is determined by dividing the recovery value by the principal outstanding at the date of default.

4.3.1 Facility Level Recovery Analysis

Recovery analysis for the Study is based on the assumption that all senior secured project finance debt facilities for a single defaulted project would share the same ultimate recovery rate – and the Study Data Set has been conformed accordingly (see Section 4.4 below). However, Basel II requires that recovery analysis is undertaken for each defaulted facility.[9] We have therefore undertaken a facility level recovery analysis as part of the Study.

Exhibit 4 shows that for the Study Data Set, there is minimal difference between (1) the average ultimate recovery rate calculated on a project level basis; and (2) the average ultimate recovery rate calculated on a facility level basis.

Exhibit 4 also shows that for the Study Data Set, there is minimal difference between (1) the average recovery rate for distressed sales calculated on a project level basis; and (2) the average recovery rate for distressed sales calculated on a facility level basis.

In the Study, therefore, we do not distinguish between project level and facility level ultimate recoveries nor project level and facility level distressed sales, other than in this Section 4.3.1.

The number of defaults of facilities backed or insured by Export Credit Agencies is de minimis, and is not statistically significant.

[9] See paragraph 431 of the Basel II Framework (http://www.bis.org/publ/bcbs128.htm):

"431. Banks using the advanced IRB approach must also collect and store a complete history of data on the LGD and EAD estimates associated with each facility and the key data used to derive the estimate and the person/model responsible. Banks must also collect data on the estimated and realized LGDs and EADs associated with each defaulted facility. Banks that reflect the credit risk mitigating effects of guarantees/credit derivatives through LGD must retain data on the LGD of the facility before and after evaluation of the effects of the guarantee/credit derivative. Information about the components of loss or recovery for each defaulted exposure must be retained, such as amounts recovered, source of recovery (e.g., collateral, liquidation proceeds and guarantees), time period required for recovery, and administrative costs."

EXHIBIT 4

Comparison of Average Recovery Rates – Project Level vs. Facility Level Ultimate Recoveries and Distressed Sales

	Basel II Definition of Default				Moody's Definition of Default			
	Ultimate Recoveries		Distressed Sales		Ultimate Recoveries		Distressed Sales	
	Project Level Recovery Analysis	Facility Level Recovery Analysis	Project Level Recovery Analysis	Facility Level Recovery Analysis	Project Level Recovery Analysis	Facility Level Recovery Analysis	Project Level Recovery Analysis	Facility Level Recovery Analysis
Number of Recoveries	237	472	51	72	209	417	38	62
Average Recovery Rate	79.5%	80.6%	49.8%	57.2%	77.3%	78.6%	48.4%	54.6%

Source: Moody's Analytics Project Finance Data Consortium

4.4 Data Cleansing

Each lender provided standardized information for each defaulted project loan, including key dates such as origination date, maturity date, default date, date of emergence (if appropriate) or date of exit via distressed sale (if appropriate). Additional information included the project's host country, industry sector, tranche name, seniority, collateral, origination amount and post-default cash flows.

Lenders also provided a detailed narrative to accompany their data submission for each project – including a description of the project, details of the default and its cause, and an explanation of the recovery process and outcome. This narrative was used to validate the data and as a basis to reconfirm the recovery values.

Project-specific data from each lender were cross-checked based on the project's name, industry, region and key dates. Where inconsistencies were identified, lenders were asked to reconfirm their data to ensure its accuracy and consistency. Where available, external sources of information were also used to validate project data.

Where a single defaulted project was reported both as a Distressed Sale (BII) and as an Ultimate Recovery (BII) by different lenders, we categorized the default (BII) as an Ultimate Recovery (BII).

Where multiple lenders participated in the same defaulted loan, the relevant lenders reported very similar ultimate recoveries. The differences were mostly due to the timing of the emergence process or the recovery methodology[10] reported by each lender. In the small percentage of instances where different lenders reported different recovery values for the same project, we reviewed the project's narrative description to ensure that the timing and recovery methodology were correct, and reconfirmed the relevant data submitted by each lender. When working with historical data, specific details may not always be available and differences in data provided may be the result of different interpretations between lenders, such as when one lender reports an ultimate recovery and another lender reports the charge-off amount. We will continue to consult with the Data Consortium members and establish further refinements in data capture which will support more granular analysis.

4.4.1 Excluded Data

Loan details were reviewed to ensure that each debt facility met the Basel II definition of Project Finance. Loans that did not meet this definition were excluded from the Study Data Set. We reproduce the Basel II definition of Project Finance at Appendix B (Glossary).

Project loan defaults were reviewed to ensure that each loan default met the Basel II definition of default. Reported loan defaults that did not meet the Basel II definition of default were excluded.

[10] For example, distressed restructuring, or restructuring without a loss (either extended maturity and or change in amortization). In certain instances, not all banks agreed that the maturity was extended or the amortization schedule changed.

Lenders were not requested to provide recovery information for defaults in work-out (BII) – although such projects are excluded from the recovery analysis they are counted as defaults in the default analysis.

In a small number of instances where a recovery rate for an Ultimate Recovery (BII) or distressed sale (BII) (as applicable) could not be determined due to insufficient information, that project was excluded from the recovery analysis. However, if such omissions can be addressed, we would anticipate including this data in a future study based on an expanded and updated data set.

Defaults of subordinated debt facilities were excluded from the recovery analysis.

We applied an analogous approach in relation to our review of each default (Moody's), default in work-out (Moody's), distressed sale (Moody's) and Ultimate Recovery (Moody's).

4.5 Caveat – Limitations of Small Sample Sizes

In the Study, we have investigated a number of different aspects of historical project finance default and recovery rates – for example, by segmenting our analysis of default and recovery rates by industry and by region. Necessarily, such segmented analysis is likely to lead to small sample sizes which lack the statistical robustness of larger sample sizes.

As noted previously, further expansion of the Study Data Set would provide greater statistical confidence to the results and observations presented, and would support more detailed granular analysis. We will continue with our efforts to expand the Data Consortium, and we look forward to publishing further research based on an expanded and updated data set. In the meantime, we would highlight that:

» Results based on small sample sizes should be treated with caution, and

» The inclusion of additional data will lead to different results in future studies, and it is possible that such differences may be material

5. Distribution of Projects

5.1 Distribution of Projects by Region

Exhibit 5 shows the regional distribution of all the projects in the Study Data Set, and compares this with the corresponding distribution of projects in the Industry Data Set.

The Study Data Set accounts for approximately 62% of the larger Industry Data Set from 1983 through 2015. The regional concentrations of the Study Data Set are similar to those of the Industry Data Set – the correlation between the regional concentrations of the two data sets is around 90%. However, there are notable differences between the two data sets in their respective concentrations in Asia[11], North America and Western Europe. It is likely that these differences are the result of the different client relationships, loan origination strategy and geographic focus of each participant in the Data Consortium, as well as the potential classification differences discussed in Section 3.

As Asia is under-represented in the Study Data Set, we are keen to encourage project finance lenders that are active in this region to participate in the Data Consortium.

[11] We note that we have reclassified countries previously classified as Southeast Asia as Asia.

EXHIBIT 5

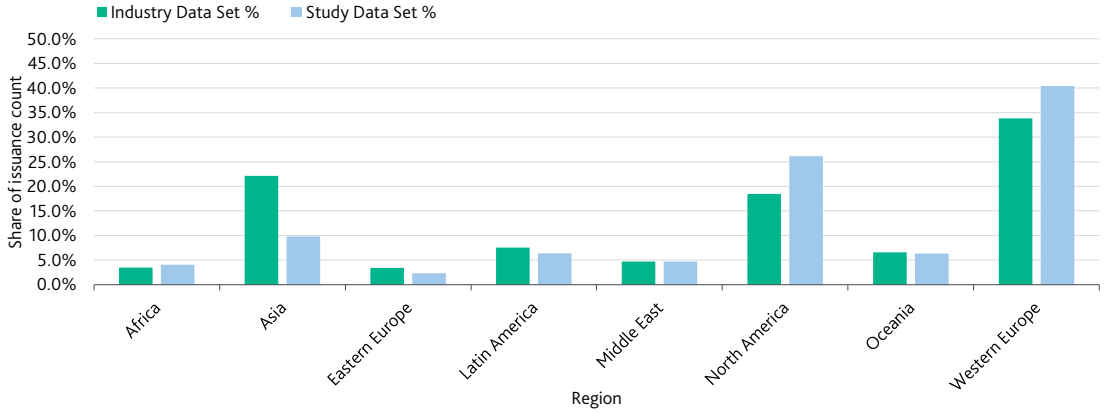
Comparison of Study Data Set and Industry Data Set by Region

Region	Industry Data Set	Industry Data Set %	Study Data Set	Study Data Set %
Africa	354	3.4%	257	4.0%
Asia	2,273	22.1%	624	9.8%
Eastern Europe	347	3.4%	148	2.3%
Latin America	777	7.6%	408	6.4%
Middle East	484	4.7%	298	4.7%
North America	1,895	18.4%	1,669	26.1%
Oceania	677	6.6%	405	6.3%
Western Europe	3,473	33.8%	2,580	40.4%
Total	**10,280**	**100.0%**	**6,389**	**100.0%**

Source: Moody's Analytics Project Finance Data Consortium

EXHIBIT 6

Comparison of Study Data Set and Industry Data Set by Region



Source: Moody's Analytics Project Finance Data Consortium

5.2 Distribution of Projects by Industry

Exhibit 7 shows the industry sector distribution of all the projects in the Study Data Set, and compares this with the corresponding distribution of projects in the Industry Data Set. In our analysis of industry sectors the Infrastructure industry refers specifically to the sub-set of social and transportation infrastructure projects within the Study Data Set.

The Study Data Set accounts for approximately 62% of the larger Industry Data Set from 1983 through 2015. The industry concentrations of the Study Data Set are very similar to those of the Industry Data Set – the correlation between the industry concentrations of the two data sets is around 99%. There are modest differences between the two data sets in their respective concentrations in the Infrastructure and Oil & Gas industry sectors. It is likely that these differences are the result of the different client relationships, loan origination strategy and industrial focus of each participant in the Data Consortium, as well as the potential classification differences discussed in Section 3.

EXHIBIT 7

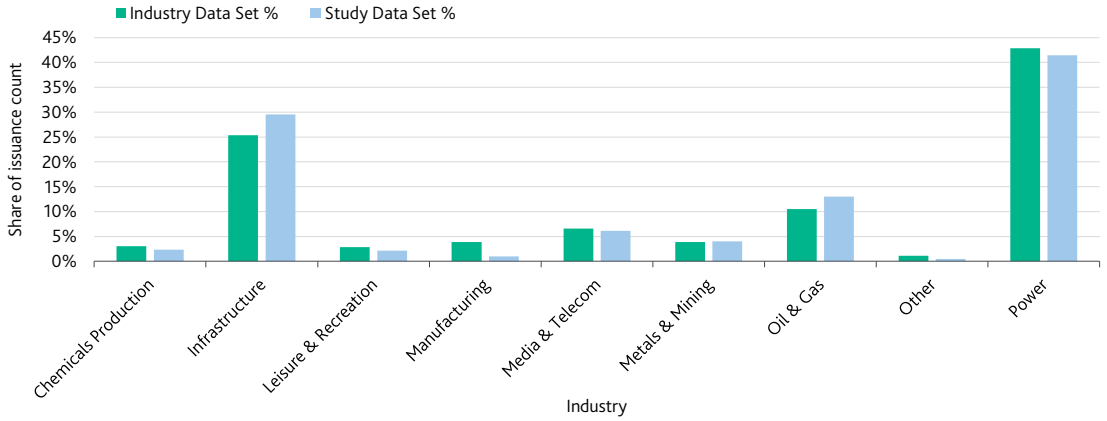
Comparison of Study Data Set and Industry Data Set by Industry Sector

Industry	Industry Data Set	Industry Data Set %	Study Data Set	Study Data Set %
Chemicals Production	310	3.0%	150	2.3%
Infrastructure	2,605	25.3%	1,886	29.5%
Leisure & Recreation	295	2.9%	137	2.1%
Manufacturing	397	3.9%	64	1.0%
Media & Telecom	678	6.6%	392	6.1%
Metals & Mining	399	3.9%	254	4.0%
Oil & Gas	1,082	10.5%	831	13.0%
Other	111	1.1%	28	0.4%
Power	4,403	42.8%	2,647	41.4%
Total	**10,280**	**100.0%**	**6,389**	**100.0%**

Source: Moody's Analytics Project Finance Data Consortium

EXHIBIT 8

Comparison of Study Data Set and Industry Data Set by Industry Sector



Source: Moody's Analytics Project Finance Data Consortium

6. Distribution of Defaults

6.1 Distribution of Defaults by Region

Exhibit 9 shows the regional distribution of the 460 defaults (BII) in the Study Data Set. The three most significant regions are North America, Western Europe and Asia, accounting for 77.0% of total defaults (BII).

EXHIBIT 9
Distribution of Defaults by Region

	Basel II Definition of Default		Moody's Definition of Default	
Region	Defaults (BII)	Regional Concentration %	Defaults (Moody's)	Regional Concentration %
Africa	10	2.2%	7	1.9%
Asia	57	12.4%	52	14.3%
Eastern Europe	8	1.7%	7	1.9%
Latin America	55	12.0%	52	14.3%
Middle East	6	1.3%	5	1.4%
North America	138	30.0%	118	32.5%
Oceania	27	5.9%	24	6.6%
Western Europe	159	34.6%	98	27.0%
Total	**460**	**100.0%**	**363**	**100.0%**

Source: Moody's Analytics Project Finance Data Consortium

6.2 Distribution of Defaults by Industry Sector

Exhibit 10 shows the industry sector distribution of the 460 defaults (BII) in the Study Data Set. The three most significant industry sectors are Power, Infrastructure and Oil & Gas, accounting for 73.3% of total defaults (BII).

EXHIBIT 10
Distribution of Defaults by Industry Sector

	Basel II Definition of Default		Moody's Definition of Default	
Industry	Defaults (BII)	Industry Sector Concentration %	Defaults (Moody's)	Industry Sector Concentration %
Chemicals Production	15	3.3%	15	4.1%
Infrastructure	111	24.1%	68	18.7%
Leisure & Recreation	10	2.2%	10	2.8%
Manufacturing	15	3.3%	15	4.1%
Media & Telecom	49	10.7%	45	12.4%
Metals & Mining	32	7.0%	31	8.5%
Oil & Gas	55	12.0%	44	12.1%
Other	2	0.4%	2	0.6%
Power	171	37.2%	133	36.6%
Total	**460**	**100.0%**	**363**	**100.0%**

Source: Moody's Analytics Project Finance Data Consortium

7. Default Rate Analysis

7.1 Cohort Analysis: 1990 – 2015

Cumulative default rates are derived from monthly marginal default rates based on static pool cohorts which follow the default behavior of the projects in each cohort, in annual intervals since financial close.

Cohort Analysis – Methodology

The cumulative default rate calculation methodology used by Moody's is a discrete-time approximation of the non-parametric continuous-time hazard rate approach. A static pool cohort is formed based on the number of active projects on January 1 of each year, and the default/survival status of the members of the cohort was tracked from 1990-2015. Projects which are active on January 1 of each cohort year include loans originated from the commencement of the Study period in 1983.

The time horizon T for which we wish to measure a cumulative default rate is divided into years. Hence, the data is discrete in that the time to default is not measured continuously. In Exhibit 11, each cohort has N(0) active projects on January 1 of the initial cohort year with time intervals of t years thereafter labeled as years 1, 2, 3 etc.

Based on a monthly time interval, the marginal default rate (hazard rate) is the probability that a project that has survived in the cohort up to the beginning of a particular month will default by the end of that month. The marginal default rate is calculated as the ratio of defaults in that month to the number of surviving projects at the beginning of that month. Projects that have been repaid during that month are excluded from the count of survivors in subsequent time intervals.

Cumulative default rates for each cohort (as shown in Exhibits 11 and 12) are derived from monthly marginal default rates for that cohort.

Average cumulative default rates for all cohorts 1990-2015 are derived from the weighted average marginal default rates from all the available cohort marginal default rates (1990-2015) – i.e., monthly marginal default rates are weighted by the relevant number of active projects at the start of year t for that cohort.

Average annual marginal default rates (1990-2015) are derived from average cumulative default rates (1990-2015).

7.1.1 Cumulative Default Rates

Exhibit 11 tabulates cumulative default rates (BII) for cohorts 1990-2015. For comparison purposes, we have included certain cumulative default rate data taken from our published research on default and recovery rates for corporate bond and loan issuers rated in the Baa and Ba rating categories.[12]

It is apparent that the 10-year cumulative default rate (BII) for the Study Data Set is consistent with 10-year cumulative default rates for corporate issuers of low investment grade credit quality.[13]

[12] See Moody's Special Comment: "Corporate Default and Recovery Rates, 1920-2015," February 2016

[13] The comparative 10-year cumulative default rate for the Baa3 rating category is 5.4% (see Exhibit 35 of Moody's Special Comment "Corporate Default and Recovery Rates, 1920-2015," February 2016)

Commentary on Changes in Sector-specific 10-year Cumulative Default rates for this Study Data Set Compared with those Shown in our Previous Study

The 10-year cumulative default rate (BII) for the Study Data Set is 6.7% and the 10-year cumulative default rate (Moody's) for the Study Data Set is 4.9%. In our previous study published in March 2016, the 10-year cumulative default rate (BII) was 6.4% and the 10-year cumulative default rate (Moody's) was 5.0%. The Study Data Set is 9% larger than that of our previous study with an additional 509 projects and 35 defaults (BII).

Compared with our previous study (Note: Publication of certain analysis has been withheld at the request of the Data Consortium):

- By number of projects, the three largest industry sectors remain Power (41.4%), Infrastructure (29.5%) and Oil & Gas (13.0%), representing 84.0% in aggregate of the 6,389 projects in the Study Data Set.
- By number of defaults (BII), the three largest sectors Power (37.2%), Infrastructure (24.1%) and Oil & Gas (12.0%) represent 73.3% in aggregate of the 460 defaults (BII) in the Study Data Set.
- For the Power, Infrastructure and Oil & Gas industry sectors:
  - the simple average default rate (BII) for the Power industry sector has improved to 6.5%, from 6.9%;
  - the simple average default rate (BII) for the Infrastructure industry sector has deteriorated to 5.9%, from 5.4%; and
  - the simple average default rate (BII) for the Oil & Gas industry sector has deteriorated to 6.6%, from 6.2%
- The results are based on different data sets and therefore, differences in these default rates can occur. The sector composition and historical profile of data additions will also impact default rates.

EXHIBIT 11

Cumulative Default Rates for Cohorts 1990-2015 (Basel II Definition of Default)

	N(0) (Note 1)	1	2	3	4	5	6	7	8	9	10
1990	47	2.13%	2.13%	14.89%	14.89%	17.19%	26.53%	28.90%	28.90%	28.90%	28.90%
1991	71	0.00%	8.45%	8.45%	11.43%	17.54%	20.65%	22.27%	22.27%	25.81%	25.81%
1992	105	5.71%	7.62%	10.58%	14.60%	16.68%	17.76%	17.76%	20.13%	20.13%	22.61%
1993	134	1.49%	3.79%	6.91%	9.32%	10.99%	11.84%	14.58%	14.58%	17.44%	17.44%
1994	166	2.43%	5.52%	8.68%	10.65%	12.67%	15.52%	15.52%	19.28%	19.28%	19.28%
1995	264	2.29%	5.01%	7.06%	9.55%	12.14%	12.14%	14.89%	16.76%	16.76%	17.29%
1996	340	2.37%	5.16%	8.35%	10.67%	11.36%	14.18%	15.64%	15.64%	16.44%	16.44%
1997	415	2.70%	7.01%	10.43%	11.54%	15.31%	18.34%	18.34%	19.04%	19.46%	19.46%
1998	515	3.56%	7.04%	8.33%	12.14%	16.62%	17.38%	17.93%	18.28%	18.28%	18.28%
1999	697	2.46%	3.67%	6.97%	11.58%	12.96%	13.55%	13.99%	13.99%	13.99%	13.99%
2000	836	1.36%	4.85%	10.27%	12.14%	12.96%	13.68%	13.88%	13.88%	13.88%	13.88%
2001	992	3.01%	10.00%	12.53%	13.31%	14.05%	14.37%	14.37%	14.37%	14.57%	14.76%
2002	1046	7.26%	11.13%	12.18%	12.99%	13.45%	13.45%	13.45%	14.03%	14.22%	14.67%
2003	1061	3.82%	5.02%	5.77%	6.34%	6.50%	6.67%	7.20%	7.57%	8.18%	8.18%
2004	1131	1.29%	2.03%	2.63%	3.02%	3.31%	3.75%	4.22%	4.73%	4.73%	4.92%
2005	1218	0.80%	1.30%	2.06%	2.29%	2.91%	3.30%	3.72%	4.02%	4.18%	4.18%
2006	1380	0.46%	1.04%	1.40%	1.87%	2.27%	2.69%	3.25%	3.61%	3.86%	4.61%
2007	1590	0.52%	1.02%	1.89%	2.82%	3.74%	4.37%	4.85%	5.64%	6.34%	
2008	1933	0.59%	1.98%	3.09%	4.18%	5.13%	5.78%	6.69%	7.23%		
2009	2180	1.40%	2.58%	3.60%	4.57%	5.61%	6.83%	7.48%			
2010	2305	1.07%	2.08%	3.07%	4.12%	5.27%	5.93%				
2011	2496	0.91%	1.97%	3.11%	4.15%	4.76%					
2012	2668	1.02%	2.28%	3.42%	4.18%						
2013	2734	1.24%	2.34%	3.03%							
2014	2847	1.12%	1.82%								
2015	3024	0.67%									
Cumulative Default Rate (BII)		**1.47%**	**2.86%**	**4.01%**	**4.88%**	**5.56%**	**6.01%**	**6.31%**	**6.53%**	**6.65%**	**6.74%**
Moody's Baa (Note 2)		0.20%	0.51%	0.85%	1.27%	1.68%	2.10%	2.50%	2.90%	3.32%	3.78%
Moody's Ba (Note 2)		0.96%	2.66%	4.73%	6.90%	8.81%	10.57%	12.13%	13.60%	15.00%	16.41%

Notes:

1) N(0) represents the number of active projects as at January 1.

2) Comparative cumulative default rate data reproduced from Moody's Special Comment, "Corporate Default and Recovery Rates, 1920-2015," February 2016, see Exhibit 34.

Source: Moody's Analytics Project Finance Data Consortium

Exhibit 12 tabulates cumulative default rates (Moody's) for cohorts 1990-2015.

EXHIBIT 12

Cumulative Default Rates for Cohorts 1990-2015 (Moody's Definition of Default)

	N(0) (Note 1)	1	2	3	4	5	6	7	8	9	10
1990	47	2.13%	2.13%	14.89%	14.89%	17.19%	26.53%	28.90%	28.90%	28.90%	28.90%
1991	71	0.00%	8.45%	8.45%	11.43%	17.54%	20.65%	22.27%	22.27%	24.04%	24.04%
1992	105	5.71%	7.62%	10.58%	14.60%	16.68%	17.76%	17.76%	18.96%	20.18%	21.43%
1993	134	1.49%	3.79%	6.91%	9.32%	10.99%	10.99%	12.81%	13.76%	15.67%	15.67%
1994	166	2.43%	5.52%	8.05%	10.02%	11.37%	12.79%	13.53%	16.54%	16.54%	16.54%
1995	264	2.29%	4.63%	6.67%	8.74%	10.48%	10.92%	13.22%	15.09%	15.09%	15.61%
1996	340	2.08%	4.25%	7.11%	8.77%	9.80%	12.28%	13.73%	13.73%	14.13%	14.13%
1997	415	2.21%	5.76%	8.66%	10.04%	13.22%	16.54%	16.54%	16.89%	17.30%	17.30%
1998	517	2.95%	6.02%	7.51%	10.63%	15.32%	15.81%	16.09%	16.43%	16.43%	16.43%
1999	701	2.16%	3.67%	6.32%	11.06%	12.26%	12.85%	13.08%	13.08%	13.08%	13.08%
2000	842	1.60%	4.55%	9.93%	11.34%	12.16%	12.53%	12.53%	12.53%	12.53%	12.53%
2001	996	2.58%	9.32%	11.49%	12.28%	12.73%	12.89%	12.89%	12.89%	13.08%	13.28%
2002	1053	7.02%	10.54%	11.59%	12.01%	12.31%	12.31%	12.31%	12.88%	13.07%	13.07%
2003	1070	3.50%	4.59%	4.97%	5.40%	5.40%	5.57%	6.25%	6.43%	6.62%	6.62%
2004	1143	1.10%	1.53%	2.00%	2.26%	2.40%	2.98%	3.28%	3.45%	3.45%	3.63%
2005	1229	0.45%	0.85%	1.38%	1.50%	1.98%	2.23%	2.37%	2.80%	2.95%	3.11%
2006	1393	0.38%	0.79%	1.06%	1.43%	1.62%	1.72%	2.16%	2.39%	2.51%	2.63%
2007	1603	0.32%	0.74%	1.46%	2.07%	2.32%	2.85%	3.13%	3.81%	3.91%	
2008	1947	0.48%	1.36%	2.23%	2.67%	3.40%	3.90%	4.64%	4.71%		
2009	2194	0.88%	1.90%	2.38%	3.11%	3.71%	4.53%	4.66%			
2010	2329	0.92%	1.40%	2.11%	2.71%	3.62%	3.73%				
2011	2523	0.41%	1.15%	1.80%	2.63%	2.77%					
2012	2706	0.73%	1.39%	2.33%	2.60%						
2013	2777	0.63%	1.48%	1.71%							
2014	2899	0.81%	1.07%								
2015	3082	0.23%									
Cumulative Default Rate (Moody's)		**1.15%**	**2.23%**	**3.10%**	**3.72%**	**4.18%**	**4.48%**	**4.66%**	**4.79%**	**4.85%**	**4.88%**
Moody's Baa (Note 2)		0.20%	0.51%	0.85%	1.27%	1.68%	2.10%	2.50%	2.90%	3.32%	3.78%
Moody's Ba (Note 2)		0.96%	2.66%	4.73%	6.90%	8.81%	10.57%	12.13%	13.60%	15.00%	16.41%

Notes:

1) N(0) represents the number of active projects as at January 1.

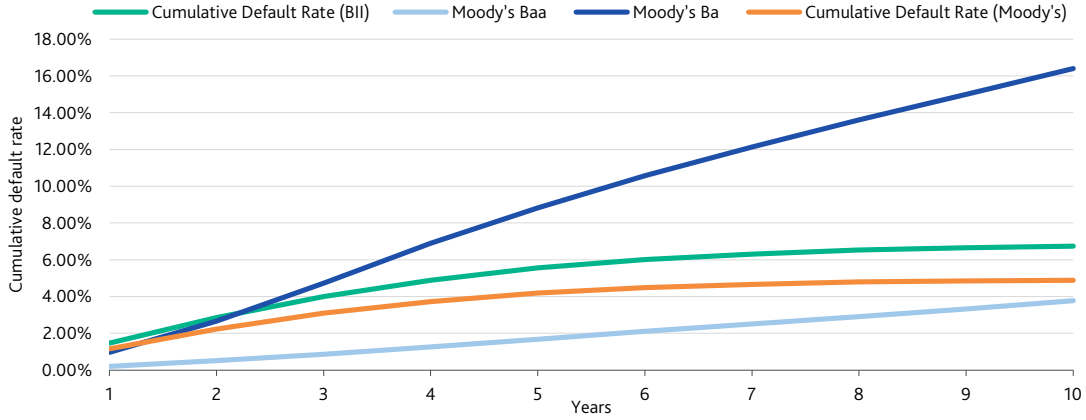
2) Comparative cumulative default rate data reproduced from Moody's Special Comment, "Corporate Default and Recovery Rates, 1920-2015," February 2016, see Exhibit 34.

Source: Moody's Analytics Project Finance Data Consortium

Exhibit 13 charts the data presented in Exhibits 11 and 12:

EXHIBIT 13

Cumulative Default Rates



Source: Moody's Analytics Project Finance Data Consortium

7.1.2 Marginal Annual Default Rates

Exhibit 14 tabulates marginal annual default rates for the Study Data Set based on cohorts 1990-2015. For comparison, we have included marginal annual default rate data derived from our published research on default and recovery rates for corporate bond and loan issuers rated in the single-A, Baa and Ba rating categories.[14]

» It is apparent that marginal annual default rates (BII) for project finance bank loans average close to 1.5% per annum during an initial two year period following financial close. However, they fall significantly thereafter to levels consistent with single-A category corporate ratings by year seven from financial close.

» This characteristic of project finance bank loans is significantly different from the marginal annual default rates we have observed for investment grade corporate issuers, which are broadly stable.

» The initial period of elevated marginal default rates is likely linked to higher default risk during the construction phase or initial start-up challenges during the ramp up of operations. Once a project has built an operating track record, the data suggests that default risk declines.

[14] See Moody's Special Comment: "Corporate Default and Recovery Rates, 1920-2015," February 2016

EXHIBIT 14

Marginal Annual Default Rates

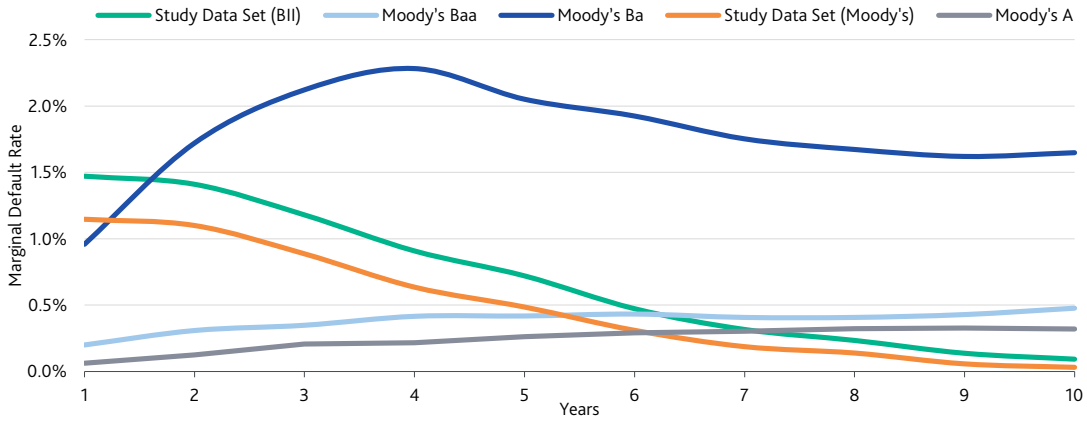
	Marginal Annual Default Rate %				
Year	Study Data Set (BII)	Study Data Set (Moody's)	Moody's A	Moody's Baa	Moody's Ba
1	1.47%	1.15%	0.06%	0.20%	0.96%
2	1.41%	1.10%	0.13%	0.31%	1.72%
3	1.18%	0.89%	0.21%	0.35%	2.12%
4	0.91%	0.64%	0.22%	0.42%	2.28%
5	0.72%	0.49%	0.26%	0.42%	2.05%
6	0.47%	0.31%	0.29%	0.43%	1.92%
7	0.32%	0.19%	0.30%	0.41%	1.75%
8	0.23%	0.14%	0.32%	0.41%	1.67%
9	0.14%	0.06%	0.33%	0.43%	1.62%
10	0.09%	0.03%	0.32%	0.48%	1.65%

Source: Moody's Analytics Project Finance Data Consortium

Exhibit 15 charts the data presented in Exhibit 14:

EXHIBIT 15

Marginal Annual Default Rates



Source: Moody's Analytics Project Finance Data Consortium

7.2 Average Default Rates by Region

Exhibit 16 shows simple average default rates by region.

Caveat: The simple average default rates included in Exhibit 16 should be interpreted with caution, since (1) they do not reflect the risk profiles of individual projects, which are likely to change based on time from origination; and (2) they do not reflect the time-weighted population of active projects exposed to default.

EXHIBIT 16

Average Default Rates by Region

		Basel II Definition of Default		Moody's Definition of Default	
Region	Projects (Note 1)	Defaults (Note 2)	Average Default Rate %	Defaults (Note 3)	Average Default Rate %
Africa	257	10	3.9%	7	2.7%
Asia	624	57	9.1%	52	8.3%
Eastern Europe	148	8	5.4%	7	4.7%
Latin America	408	55	13.5%	52	12.7%
Middle East	298	6	2.0%	5	1.7%
North America	1,669	138	8.3%	118	7.1%
Oceania	405	27	6.7%	24	5.9%
Western Europe	2,580	159	6.2%	98	3.8%
Total	**6,389**	**460**	**7.2%**	**363**	**5.7%**

Notes:

1) Based on 6,389 projects

2) Based on 460 defaults (BII)

3) Based on 363 defaults (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

Simple average default rates calculated for the Study Data Set vary significantly by region – for example default rates for the Middle East, Africa and European regions are substantially lower than default rates for Latin America, North America and Asia.

Exhibits 17 and 18 tabulate average cumulative default rates for cohorts 1990-2015, broken down by region. Due to the small size of the regional subsets, differences between regional and average cumulative default rates for the Study Data Set may be due to statistical variations.

Caveat: The cumulative default rates included in Exhibit 17 should be interpreted with caution, since for certain regions sample sizes are small and do not support statistically robust conclusions.

EXHIBIT 17

Cumulative Default Rates by Region for Cohorts 1990-2015 (Basel II Definition of Default)

YEARS FROM FINANCIAL CLOSE	1	2	3	4	5	6	7	8	9	10
Africa	0.95%	1.88%	2.75%	3.10%	3.46%	3.72%	3.72%	3.72%	3.72%	3.72%
Asia	1.96%	3.80%	5.28%	6.27%	7.05%	7.46%	7.74%	7.99%	8.04%	8.09%
Eastern Europe	1.04%	2.18%	3.13%	3.81%	4.18%	4.18%	4.18%	4.18%	4.18%	4.18%
Latin America	3.21%	6.25%	8.64%	10.39%	11.40%	11.73%	11.91%	12.09%	12.18%	12.28%
Middle East	0.36%	0.75%	1.01%	1.22%	1.44%	1.59%	1.74%	1.82%	1.82%	1.82%
North America	2.00%	3.93%	5.34%	6.34%	7.19%	7.78%	8.19%	8.41%	8.58%	8.67%
Oceania	1.79%	3.41%	4.79%	5.87%	6.83%	7.45%	7.66%	7.77%	7.77%	7.77%
Western Europe	1.08%	2.09%	3.02%	3.83%	4.45%	4.91%	5.22%	5.48%	5.65%	5.77%
Cumulative Default Rate (BII)	**1.47%**	**2.86%**	**4.01%**	**4.88%**	**5.56%**	**6.01%**	**6.31%**	**6.53%**	**6.65%**	**6.74%**
Moody's Baa (Note 1)	0.20%	0.51%	0.85%	1.27%	1.68%	2.10%	2.50%	2.90%	3.32%	3.78%
Moody's Ba (Note 1)	0.96%	2.66%	4.73%	6.90%	8.81%	10.57%	12.13%	13.60%	15.00%	16.41%

Note:

1) Comparative cumulative default rate data reproduced from Moody's Special Comment, "Corporate Default and Recovery Rates, 1920-2015," February 2016, see Exhibit 34.

Source: Moody's Analytics Project Finance Data Consortium

EXHIBIT 18

Cumulative Default Rates by Region for Cohorts 1990-2015 (Moody's Definition of Default)

YEARS FROM FINANCIAL CLOSE	1	2	3	4	5	6	7	8	9	10
Africa	0.67%	1.38%	2.15%	2.37%	2.61%	2.73%	2.73%	2.73%	2.73%	2.73%
Asia	1.78%	3.45%	4.88%	5.82%	6.60%	7.00%	7.28%	7.52%	7.57%	7.57%
Eastern Europe	0.91%	1.91%	2.69%	3.38%	3.57%	3.57%	3.57%	3.57%	3.57%	3.57%
Latin America	2.99%	5.80%	8.15%	9.87%	10.85%	11.18%	11.35%	11.53%	11.62%	11.71%
Middle East	0.30%	0.62%	0.82%	0.96%	1.11%	1.11%	1.11%	1.11%	1.11%	1.11%
North America	1.69%	3.32%	4.53%	5.38%	6.08%	6.57%	6.90%	7.12%	7.24%	7.30%
Oceania	1.57%	3.03%	4.24%	5.21%	6.06%	6.57%	6.68%	6.79%	6.79%	6.79%
Western Europe	0.65%	1.27%	1.78%	2.16%	2.45%	2.69%	2.83%	2.94%	2.98%	3.00%
Cumulative Default Rate (Moody's)	**1.15%**	**2.23%**	**3.10%**	**3.72%**	**4.18%**	**4.48%**	**4.66%**	**4.79%**	**4.85%**	**4.88%**
Moody's Baa (Note 1)	0.20%	0.51%	0.85%	1.27%	1.68%	2.10%	2.50%	2.90%	3.32%	3.78%
Moody's Ba (Note 1)	0.96%	2.66%	4.73%	6.90%	8.81%	10.57%	12.13%	13.60%	15.00%	16.41%

Note:

1) Comparative cumulative default rate data reproduced from Moody's Special Comment, "Corporate Default and Recovery Rates, 1920-2015," February 2016, see Exhibit 34.

Source: Moody's Analytics Project Finance Data Consortium

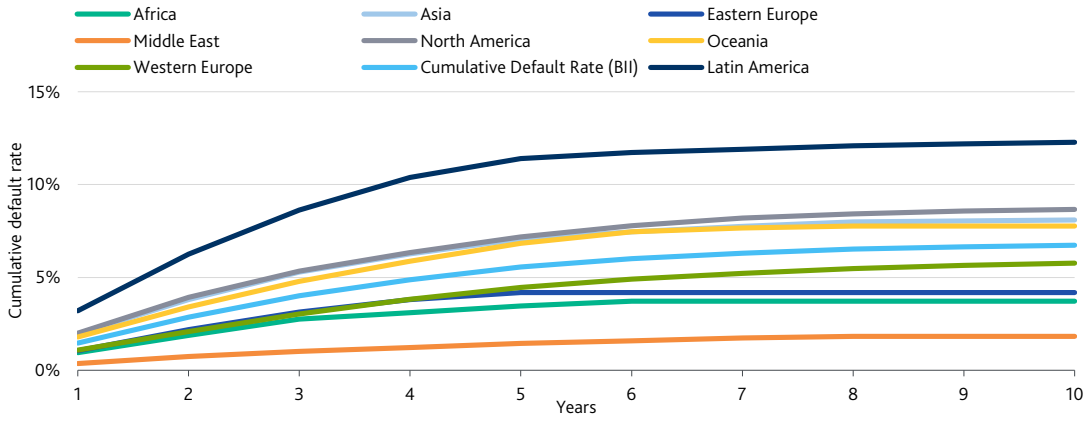
Exhibit 19 charts the data presented in Exhibit 17 i.e., cumulative default rates (BII) for each region.

Latin America has very little history in the years 1991-1997, with a substantial number of defaults relative to the number of originated and active projects. The cumulative default rates for the region reflect this distortion. We observe that the average time to default for projects in Latin America was 3.2 years (BII) (see Exhibit 37).

Default history in Africa and the Middle East has been low, with only 16 defaults in the Study Data Set. For the Middle East region, against a background of regional geopolitical tensions exemplified by the Gulf War 1990-91, the invasion of Iraq in 2003, the wave of Arab Spring uprisings commencing 2011 and the Israeli/Palestinian conflict, this outcome is highly notable.

EXHIBIT 19

Cumulative Default Rates (BII) by Region



Source: Moody's Analytics Project Finance Data Consortium

7.2.1 Average Default Rate by OECD/Non-OECD Countries and World Bank Group Country Classification

Exhibit 20 shows simple average default rates by World Bank Group Country Classification, that classifies countries by their income levels; as well as by OECD/non-OECD countries. Exhibit 20 has been prepared on the basis of the 34 OECD member countries as at 31 December 2015 – the list of OECD members is included in Appendix B (Glossary). A more detailed description of the World Bank Group Country Classification is included in Appendix B (Glossary). We note that observations for low-income economies is very limited and does not allow for statistically significant conclusions.

Caveat: The simple average default rates included in Exhibit 20 should be interpreted with caution, since (1) they do not reflect the risk profiles of individual projects, which are likely to change based on time from origination; and (2) they do not reflect the time-weighted population of active projects exposed to default.

EXHIBIT 20

Average Default Rates by OECD/non-OECD Countries as well as World Bank Group Country Classification

		Basel II Definition of Default		Moody's Definition of Default	
World Bank Group Country Classification	Projects (Note 1)	Defaults (Note 2)	Average Default Rate %	Defaults (Note 3)	Average Default Rate %
High-income economies	5,296	362	6.8%	280	5.3%
Upper-middle-income economies	638	51	8.0%	42	6.6%
Lower-middle-income economies	394	45	11.4%	39	9.9%
Low-income economies	37	2	5.4%	2	5.4%
Others	2				
Total	**6,389**	**460**	**7.2%**	**363**	**5.7%**
OECD/Non-OECD Countries					
OECD	4,975	334	6.7%	249	5.0%
Non-OECD	1,414	126	8.9%	114	8.1%
Total	**6,389**	**460**	**7.2%**	**363**	**5.7%**

Notes:

1) Based on 6,389 projects

2) Based on 460 defaults (BII)

3) Based on 363 defaults (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

Exhibit 21 tabulates average cumulative default rates (BII) for cohorts 1990-2015, broken down by OECD/non-OECD countries as well as World Bank Group Country Classification.

EXHIBIT 21

Cumulative Default Rates by OECD/non-OECD Countries as well as World Bank Group Country Classification for Cohorts 1990-2015 (Basel II Definition of Default)

Years from Financial Close	1	2	3	4	5	6	7	8	9	10
World Bank Group Country Classification										
High-income economies	1.38%	2.67%	3.75%	4.59%	5.26%	5.71%	6.01%	6.23%	6.37%	6.46%
Upper-middle-income economies	1.80%	3.45%	4.70%	5.81%	6.52%	6.90%	7.20%	7.40%	7.46%	7.51%
Lower-middle-income economies	2.42%	4.79%	6.77%	7.89%	8.95%	9.46%	9.77%	10.01%	10.09%	10.17%
OECD/Non-OECD										
OECD	1.36%	2.63%	3.70%	4.54%	5.21%	5.68%	6.00%	6.23%	6.38%	6.48%
Non-OECD	1.90%	3.71%	5.16%	6.17%	6.89%	7.23%	7.45%	7.62%	7.67%	7.71%
Cumulative Default Rate (BII) - Study Date Average	1.47%	2.86%	4.01%	4.88%	5.56%	6.01%	6.31%	6.53%	6.65%	6.74%
Moody's Baa (Note 1)	0.20%	0.51%	0.85%	1.27%	1.68%	2.10%	2.50%	2.90%	3.32%	3.78%
Moody's Ba (Note 1)	0.96%	2.66%	4.73%	6.90%	8.81%	10.57%	12.13%	13.60%	15.00%	16.41%

Note:

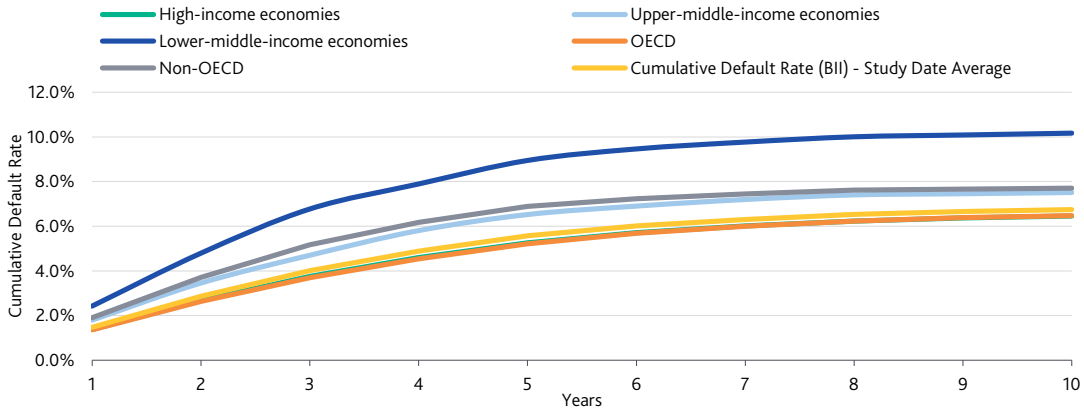
1) Comparative cumulative default rate data reproduced from Moody's Special Comment, "Corporate Default and Recovery Rates, 1920-2015," February 2016, see Exhibit 34.

Source: Moody's Analytics Project Finance Data Consortium

Exhibit 22 charts the data presented in Exhibit 21:

EXHIBIT 22

Cumulative Default Rates (BII) by OECD/non-OECD Countries and World Bank Group Country Classification



Source: Moody's Analytics Project Finance Data Consortium

7.3 Average Default Rate by Industry Sector

Exhibit 23 shows simple average default rates by industry sector.

Caveat: The simple average default rates included in Exhibit 23 should be interpreted with caution, since (1) they do not reflect the risk profiles of individual projects, which are likely to change based on time from origination; and (2) they do not reflect the time-weighted population of active projects exposed to default.

EXHIBIT 23

Average Default Rates by Industry Sector

		Basel II Definition of Default		Moody's Definition of Default	
Industry Sector	Projects (Note 1)	Defaults (Note 2)	Average Default Rate %	Defaults (Note 3)	Average Default Rate %
Chemicals Production	150	15	10.0%	15	10.0%
Infrastructure	1,886	111	5.9%	68	3.6%
Leisure & Recreation	137	10	7.3%	10	7.3%
Manufacturing	64	15	23.4%	15	23.4%
Media & Telecom	392	49	12.5%	45	11.5%
Metals & Mining	254	32	12.6%	31	12.2%
Oil & Gas	831	55	6.6%	44	5.3%
Other	28	2	7.1%	2	7.1%
Power	2,647	171	6.5%	133	5.0%
Total	**6,389**	**460**	**7.2%**	**363**	**5.7%**

Notes:

1) Based on 6,389 projects

2) Based on 460 defaults (BII)

3) Based on 363 defaults (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

It is apparent that simple average default rates calculated for the Study Data Set vary significantly by industry – for example simple average default rates for the Infrastructure industry sector are substantially lower than simple average default rates for the Manufacturing industry sector.

7.3.1 PPPs

The Study Data Set contains 1,525 projects identified as PPP projects by the Data Consortium, many of which fall within the Infrastructure industry sector, and 108 additional PPP projects compared to the March 2016 study. There is some subjectivity in the classification of projects as PPPs. The Study Data Set contains 77 defaults (BII) and 43 defaults (Moody's) of PPP projects. Notably, this year's Study Data Set contains 9 additional defaults (BII) but only 1 additional default (Moody's) and therefore, there is a greater variation in findings based on the BII definition of default for this year's study compared to the March 2016 study.

The simple average default rates of 5.0% (BII) and 2.8% (Moody's) for PPP projects are lower than the corresponding simple average default rates of 5.9% (BII) and 3.6% (Moody's) for the Infrastructure industry sector, and are substantially below the simple average default rates of 7.2% (BII) and 5.7% (Moody's) for the whole Study Data Set.

Simple average default rates for PPP projects for the period 1983-2015 are consistent with last year's study, which reported a simple average default rate of 4.8% (BII) and 3.0% (Moody's) for the period 1983-2014.

These results are also consistent with the view held by many PPP advocates that default risk for such projects is low, especially when project revenues are based on availability-based payment mechanisms and are not exposed to market risk. We comment further on our analysis of PPP projects in Appendix H (Default and Recovery Analysis for PPP projects).

7.3.2 Power

The Power industry comprises 2,647 projects with 171 defaults (BII) and 133 defaults (Moody's) in aggregate, corresponding to simple average default rates of 6.5% (BII) and 5.0% (Moody's) respectively. However, there is a marked difference in default rates for US Power and Non-US Power.

Exhibit 24 shows simple average default rates within the Power industry sector, split by US Power and Non-US Power:

EXHIBIT 24

Average Default Rates within the Power Industry – US/Non US

		Basel II Definition of Default		Moody's Definition of Default	
Power	Projects (Note 1)	Defaults (Note 2)	Average Default Rate %	Defaults (Note 3)	Average Default Rate %
US Power	902	72	8.0%	62	6.9%
Non-US Power	1,745	99	5.7%	71	4.1%
Total Power	**2,647**	**171**	**6.5%**	**133**	**5.0%**
Total Study Data	**6,389**	**460**	**7.2%**	**363**	**5.7%**
Concentration of Power	**41.4%**	**37.2%**	**N/A**	**35.5%**	**N/A**

Notes:

1) Based on 6,389 projects

2) Based on 460 defaults (BII), of which 171 are in the Power industry sector

3) Based on 363 defaults (Moody's), of which 133 are in the Power industry sector

Source: Moody's Analytics Project Finance Data Consortium

» The US Power industry sub-sector comprises 902 projects with 72 defaults (BII) and 62 defaults (Moody's), corresponding to simple average default rates of 8.0% (BII) and 6.9% (Moody's), higher than the simple average default rates of 7.2% (BII) and 5.7% (Moody's) for the whole Study Data Set. Simple average default rates for the US Power industry declined from the 9.3% (BII) and 7.9% (Moody's) reported in last year's study, as additional projects were added to the data set while the number of defaults remained largely unchanged.

» The Non-US Power industry sub-sector comprises 1,745 projects with 99 defaults (BII) and 71 defaults (Moody's), corresponding to simple average default rates of 5.7% (BII) and 4.1% (Moody's), substantially lower than US Power, and consistent with simple average default rates reported in last year's study.

We comment further on this finding in Section 7.4 (Incidence of Defaults).

Exhibit 25 tabulates cumulative default rates (BII) for cohorts 1990-2015, broken down by industry sector.

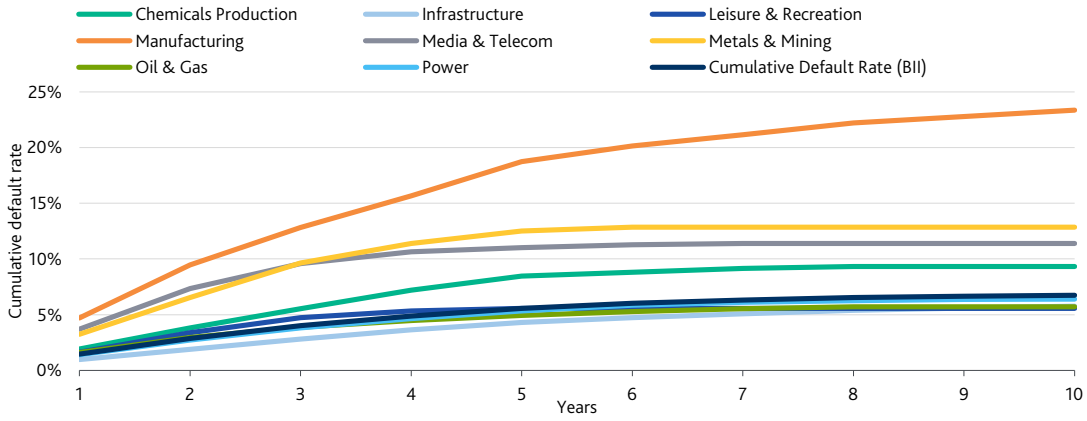
Exhibit 26 tabulates cumulative default rates (Moody's) for cohorts 1990-2015, broken down by industry sector.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis has been withheld at the request of the Data Consortium.

Exhibit 27 shows cumulative default rates (BII) by industry.

EXHIBIT 27

Cumulative Default Rates (BII) by Industry



Source: Moody's Analytics Project Finance Data Consortium

Exhibit 27 shows cumulative default rates (BII) for each industry sector. Various industry subsets flatten out after 5-6 years. However, certain subsets such as Chemicals Production and Manufacturing only flatten out after year 8 and 9, respectively. Notably, default counts included in the data set for Chemicals Production and Manufacturing are relatively low and need to be interpreted with caution. We anticipate that additional data will improve the statistical robustness of a future analysis based on an updated and expanded data set.

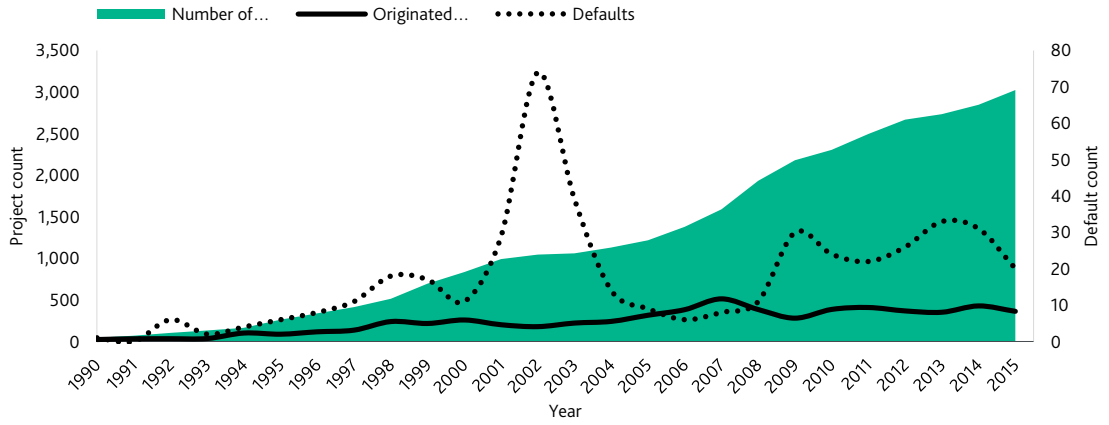
The 10-year cumulative default rate for the Infrastructure industry sector is 5.8%, better than the Study average of 6.7%, but higher than the 4.7% rate reported in the March 2016 study. The Infrastructure industry sector represents approximately 29.5% of the Study Data Set by number of projects. We comment further on the stress affecting the Infrastructure industry sector during 2009-15 in Section 7.4.3.

7.4 Incidence of Defaults (Basel II Definition of Default)

Exhibit 28 shows the incidence of project loans originated, active loans as at January 1 in the relevant year, and the incidence of defaults (BII).

EXHIBIT 28

Incidence of Projects Originated, Active and Defaulted by Year



Source: Moody's Analytics Project Finance Data Consortium

Supporting data for Exhibit 28 is set out in Exhibit 29.

As reported last year, incidence of defaults (BII) spiked sharply in 2002 and 2003. This may be partially explained by the stress affecting the Power and Media & Telecom industry sectors in the period 2001 to 2004. We comment further on this in Sections 7.4.1 and 7.4.2.

We comment on the breakdown of defaults (BII) by sector over the period 2008-15 in Section 7.4.3 below.

EXHIBIT 29

Supporting Data for Exhibit 28

		Basel II Definition of Default		Moody's Definition of Default	
Year of Origination	Originated Projects	Number of Active Projects	Defaults	Number of Active Projects	Defaults
1989 and prior	47				
1990	25	47	1	47	1
1991	34	71	0	71	0
1992	35	105	6	105	6
1993	37	134	2	134	2
1994	103	166	4	166	4
1995	89	264	6	264	6
1996	118	340	8	340	7
1997	138	415	11	415	9
1998	241	515	18	517	15
1999	218	697	17	701	15
2000	260	836	11	842	13
2001	203	992	29	996	25
2002	180	1,046	74	1,053	72
2003	223	1,061	39	1,070	36
2004	243	1,131	14	1,143	12
2005	317	1,218	9	1,229	5
2006	384	1,380	6	1,393	5
2007	514	1,590	8	1,603	5
2008	386	1,933	11	1,947	9
2009	282	2,180	30	2,194	19
2010	387	2,305	24	2,329	21
2011	410	2,496	22	2,523	10
2012	369	2,668	26	2,706	19
2013	353	2,734	33	2,777	17
2014	429	2,847	31	2,899	23
2015	364	3,024	20	3,082	7
Total	**6,389**	**N/A**	**460**	**N/A**	**363**

Note:

1) The number of active projects is stated as at January 1 of the relevant year

Source: Moody's Analytics Project Finance Data Consortium

7.4.1 Incidence of Defaults within Certain industries (Basel II Definition of Default).

Exhibit 30 shows the incidence of defaults (BII) for the following industry sectors: (1) Power, (2) Media & Telecom, (3) Infrastructure and (4) Other; and illustrates their respective contributions to aggregate defaults (BII).

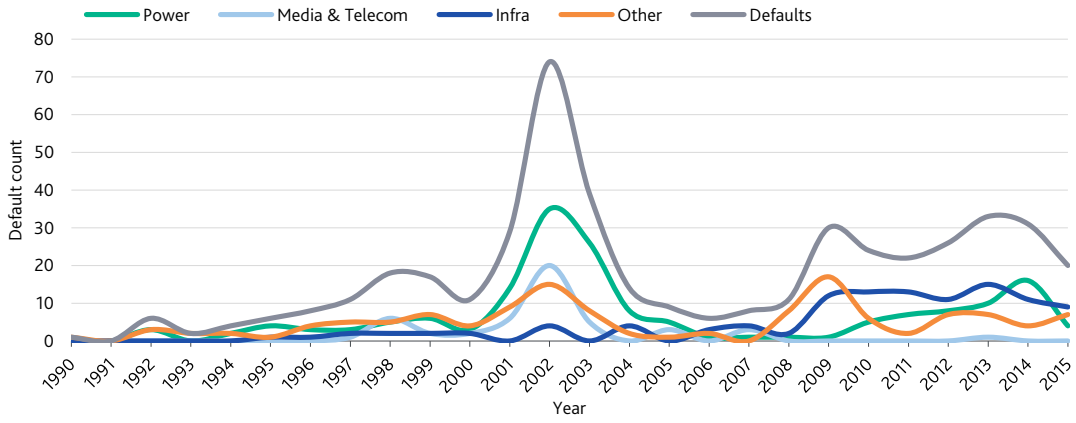
It is apparent from Exhibit 30 that the spike in defaults (BII) in 2002/3 was substantially due to stress affecting the Power and Media & Telecom industry sectors.

Supporting data for Exhibit 30 is tabulated in Exhibit 31.

However, Exhibit 30 also shows an increased incidence of defaults (BII) in 2008-14. As discussed in Section 7.4.3 below, defaults (BII) occurring 2008-14 were concentrated in the Oil & Gas, Infrastructure and Power industry sectors. The Oil & Gas subset is included in the Other category in Exhibit 30.

EXHIBIT 30

Incidence of Defaults (BII) within Certain industry Sectors



Source: Moody's Analytics Project Finance Data Consortium

7.4.2 Incidence of Defaults 2001-2004 (Basel II Definition of Default)

Exhibit 31 shows that of the 171 Defaults (BII) in the Power industry, 83 occurred between 2001-04 representing 18.0% of all 460 defaults (BII) in the Study Data Set. Exhibit 31 also shows that of the 49 defaults (BII) in the Media and Telecom industry sector, 31 occurred between 2001-03 representing 6.7% of all 460 defaults (BII) in the Study Data Set.

In relation to the stress affecting the Power industry during 2001-04, we observe:

» As noted in Exhibit 24, the Power industry comprises 2,647 projects and 171 defaults (BII), corresponding to a simple average default rate of 6.5%.

» Exhibit 24 also shows that simple average default rates for US Power are markedly higher than for non-US Power:

- The US Power sub-sector comprises 902 projects, and 72 defaults (BII), corresponding to a simple average default rate of 8.0%, somewhat higher than the simple average default rate of 7.2% for the whole Study Data Set.
- The Non-US Power sub-sector comprises 1,745 projects and 99 defaults (BII), corresponding to a simple average default rate of 5.7%, somewhat lower than the simple average default rate of 7.2% for the whole Study Data Set.

» However, further analysis of the incidence of defaults (BII) in the US Power and non-US Power sub-sectors shows that the concentration of defaults between 2001-04 is very high, particularly for non-US Power:

- The 72 defaults (BII) in the US Power sub-sector represent 15.7% of all 460 defaults (BII) in the Study Data Set. Of these 72 defaults (BII), 39 occurred between 2001-04, representing 8.5% of all 460 defaults (BII) in the Study Data Set, and 54.2% of all defaults (BII) in the US Power sub-sector.
- The 99 defaults (BII) in the Non-US Power sub-sector represent 21.5% of all 460 defaults (BII) in the Study Data Set. Out of these 99 defaults (BII), 44 occurred between 2001-04, representing 9.6% of all 460 defaults (BII) in the Study Data Set, and 44.4% of all defaults (BII) in the non-US Power sub-sector.

Exhibit 31 tabulates supporting data for Exhibit 30.

EXHIBIT 31

Supporting Data for Exhibit 30 – Defaults Split by Power, Media & Telco, Infrastructure and Other

	Basel II Definition of Default					Moody's Definition of Default				
Year of Default	Power	Media & Telecom	Infrastructure	Other	Defaults	Power	Media & Telecom	Infrastructure	Other	Defaults
1990	0	0	0	1	1	0	0	0	1	1
1991	0	0	0	0	0	0	0	0	0	0
1992	3	0	0	3	6	3	0	0	3	6
1993	0	0	0	2	2	0	0	0	2	2
1994	2	0	0	2	4	2	0	0	2	4
1995	4	0	1	1	6	4	0	1	1	6
1996	3	0	1	4	8	2	0	1	4	7
1997	3	1	2	5	11	2	1	2	4	9
1998	5	6	2	5	18	4	4	2	5	15
1999	6	2	2	7	17	5	2	1	7	15
2000	3	2	2	4	11	4	2	2	5	13
2001	14	6	0	9	29	12	5	0	8	25
2002	35	20	4	15	74	33	20	4	15	72
2003	26	5	0	8	39	24	5	0	7	36
2004	8	0	4	2	14	6	1	3	2	12
2005	5	3	0	1	9	3	1	0	1	5
2006	1	0	3	2	6	0	0	3	2	5
2007	1	3	4	0	8	0	3	2	0	5
2008	1	0	2	8	11	1	0	0	8	9
2009	1	0	12	17	30	1	0	5	13	19
2010	5	0	13	6	24	6	0	9	6	21
2011	7	0	13	2	22	2	0	6	2	10
2012	8	0	11	7	26	4	0	8	7	19
2013	10	1	15	7	33	5	1	8	3	17
2014	16	0	11	4	31	10	0	9	4	23
2015	4	0	9	7	20	0	0	2	5	7
Total	**171**	**49**	**111**	**129**	**460**	**133**	**45**	**68**	**117**	**363**

Notes:

1) 2008 Other includes 5 Oil & Gas defaults (BII)

2) 2009 Other includes 13 Oil & Gas defaults (BII)

3) 2010 Other includes 4 Oil & Gas defaults (BII)

Source: Moody's Analytics Project Finance Data Consortium

7.4.3 Incidence of Defaults 2008-2015 (Basel II Definition of Default)

Exhibit 32 shows the breakdown of Defaults during 2008-15, split by the following industry sectors: (1) Oil & Gas, (2) Infrastructure, (3) Power and (4) Other.

In relation to the stress affecting the Oil & Gas industry sector between 2008-15 we observe:

» The Study Data Set contains 55 defaults (BII) in the Oil & Gas industry sector for the period 1983-2015, representing 12.0% of all 460 defaults (BII) in the Study Data Set.

» Of these 55 defaults (BII), 22 occurred in the period 2008 to 2010, representing 40.0% of all defaults (BII) in the Oil & Gas industry.

In relation to the stress affecting the Infrastructure industry between 2009-15 we observe:

» The Study Data Set contains 111 defaults (BII) in the Infrastructure industry, representing 24.1% of all 460 defaults (BII) in the Study Data Set. Of these defaults (BII), 84 occurred in the period 2009 to 2015.

» Of the 84 defaults that occurred in the Infrastructure industry in the period 2009 to 2015: 51 were transportation projects, primarily under-utilized toll roads, and 16 were ports projects.

» Based on Moody's definition of default, there were 47 defaults that occurred in the Infrastructure industry between 2009-15, substantially fewer than the 84 defaults (BII) during the same period. The Basel II definition captures a wider range of defaults than our definition of default, including circumstances in which the reporting lender considers that the obligor is unlikely to pay its credit obligations in full. For example, under the Basel II definition, defaulted credits would also include debt obligations where (1) the bank puts the credit obligation on non-accrued status; or (2) the bank makes a charge-off or account-specific provision resulting from a significant perceived decline in credit quality.

EXHIBIT 32

Defaults Occurring 2008-2014 Split by Oil & Gas, Infrastructure, Power and Other

	Basel II Definition of Default					Moody's Definition of Default				
Year of Default	Oil & Gas	Infra	Power	Other	Defaults	Oil & Gas	Infra	Power	Other	Defaults
2008	5	2	1	3	11	5	0	1	3	9
2009	13	12	1	4	30	9	5	1	4	19
2010	4	13	5	2	24	4	9	6	2	21
2011	1	13	7	1	22	2	6	2	0	10
2012	2	11	8	5	26	2	8	4	5	19
2013	3	15	10	5	33	0	8	5	4	17
2014	3	11	16	1	31	1	9	10	3	23
2015	5	9	4	2	20	3	2	0	2	7
Total	**36**	**86**	**52**	**23**	**197**	**26**	**47**	**29**	**23**	**125**

Source: Moody's Analytics Project Finance Data Consortium

8. Recovery Analysis

8.1 Distribution of Ultimate Recovery Rates

Exhibit 33 tabulates the distribution of recovery rates for Ultimate Recoveries and Distressed Sales in the Study Data Set:

» The average recovery rate for Ultimate Recoveries of 79.5% (BII) and 77.3% (Moody's), exceeds the average recovery rate for Distressed Sales of 49.8% (BII) and 48.4% (Moody's). There are many reasons why an individual lender may choose to exit from a defaulted loan exposure via a distressed sale rather than participate in a work-out – see Section 8.8 (Cash-out or Work-out) for further comment.

» The majority of Ultimate Recoveries, 64.6% (BII) and 61.7% (Moody's), were fully restructured or repaid with no economic loss calculated on a Net Present Value basis, as described in Section 4.3.

» Just 35.4% (BII) and 38.3% (Moody's) of Ultimate Recoveries experienced an economic loss calculated on a Net Present Value basis, with average ultimate recovery rates for these projects of 42.1% (BII) and 40.7% (Moody's).

EXHIBIT 33

Distribution of Recovery Rates

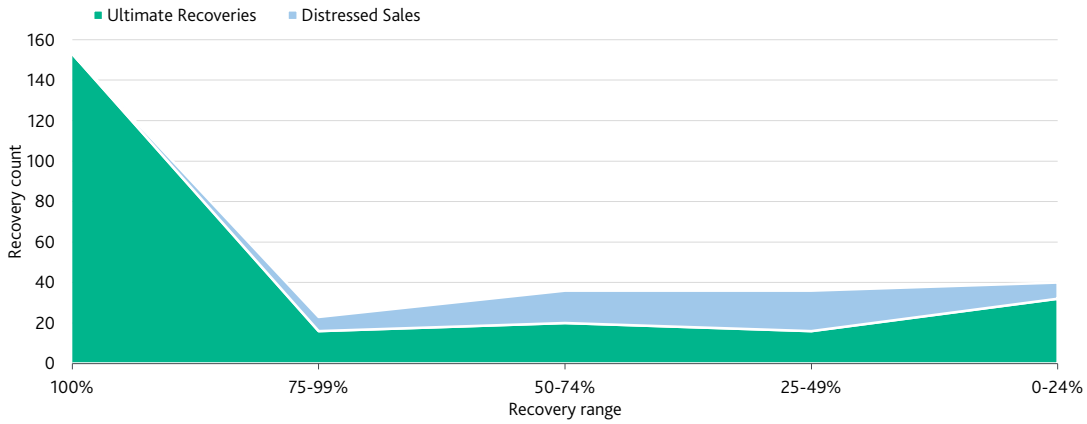
	Basel II Definition of Default		Moody's Definition of Default	
Recovery Rates	Ultimate Recoveries	Distressed Sales	Ultimate Recoveries	Distressed Sales
100%	153		129	
75-99%	16	7	13	4
50-74%	20	16	20	13
25-49%	16	20	16	13
0-24%	32	8	31	8
Total	**237**	**51**	**209**	**38**
Average recovery rate	**79.5%**	**49.8%**	**77.3%**	**48.4%**
% of projects fully restructured without loss	64.6%	0.0%	61.7%	0.0%
Average recovery rate for projects experiencing a loss	42.1%	49.8%	40.7%	48.4%

Source: Moody's Analytics Project Finance Data Consortium

Exhibit 34 charts the distribution of recovery rate data presented in Exhibit 33 based on the Basel II definition of default.

EXHIBIT 34

Distribution of Recovery Rates (BII)



Source: Moody's Analytics Project Finance Data Consortium

The distribution of recovery rates for Ultimate Recoveries shows a higher proportion of transactions at either end of the recovery spectrum, which is consistent with our observations of ultimate recovery rates for corporate loans.

The Study Data Set also includes a number of Ultimate Recoveries with ultimate recovery rates in the 0%-24% range. This points to a bimodal distribution of recovery rates which we have also observed as a feature of corporate loan ultimate recoveries. For project finance loans, very low ultimate recovery rates might be

indicative of project abandonment, or the occurrence of extreme loss scenarios originally assessed as low probability.

8.2 Ultimate Recoveries by Year of Emergence (Basel II Definition of Default)

Exhibit 35 displays average ultimate recovery rates for Ultimate Recoveries (BII) by year of emergence from default between 1999-2014. We note that data for 2015 provides little insight on average ultimate recovery rates, as the Study Data Set contains only one project that emerged from default in 2015 with a below average recovery rate of 37.6%. In addition, we exclude calendar years prior to 1999 from Exhibit 35, on the basis that the number of projects emerging from default in each of those years is relatively small.

» With the exception of 2013, average ultimate recovery rates (BII) for project finance bank loans emerging from default in the period 1999-2014 were in the range of 70.4%-100.0%. The average ultimate recovery rate (BII) for 2013 was 49.6%, which appears to be unusually low.

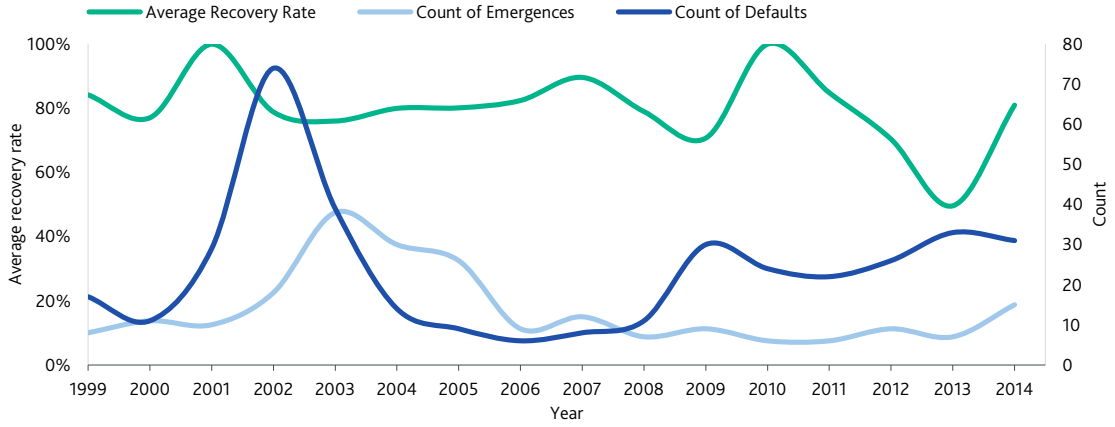
» Other than 2013, average ultimate recovery rates in 1999-2014 show substantial independence from the incidence of defaults. Similarly, average ultimate recovery rates in 1999-2014 show substantial independence from the incidence of projects emerging from default.

» This observation contrasts with Moody's research on corporate loans and bonds which has previously found that ultimate recovery rates for defaulted corporate debt facilities are negatively correlated with default rates (i.e., ultimate recovery rates fall as default rates rise).[15]

» In Section 7.4.3 above we highlighted the stress affecting the Infrastructure industry sector in the period 2009-2015, as illustrated by the 84 Defaults (BII) reported during that period. We note that only a few of these defaulted projects have emerged from default, and we will monitor the relationship between default rates and ultimate recovery rates in this sector with interest. Additional data should also provide further insight into the average ultimate recovery rate for 2015.

EXHIBIT 35

Average Recovery Rates for Ultimate Recoveries (BII) by Year of Emergence



Source: Moody's Analytics Project Finance Data Consortium

Exhibit 36 tabulates average recovery rates for Ultimate Recoveries by year of emergence, and shows the number of Emergences and Defaults in each year.

The average ultimate recovery rate (BII) of 49.6% for 2013 is based on seven projects that emerged from default - two power projects, two infrastructure projects (one of which was reported as a 100% loss), an oil & gas project (reported as a 100% loss), a media project, and a manufacturing project. The underlying data does not suggest an emerging trend, and hence the low average recovery rate for 2013 seems to be an

[15] See Moody's Special Comment: "Syndicated Bank Loans: 2008 Default Review and 2009 Outlook," March 2009

unusual outcome. We note that any recoveries on the two projects reported as 100% losses would improve the average ultimate recovery rate for 2013.

EXHIBIT 36

Average Recovery Rates for Ultimate Recoveries by Year of Emergence

	Basel II Definition of Default			Moody's Definition of Default		
Year of Emergence	Average Recovery Rate (Note 1)	Emergences	Defaults	Average Recovery Rate (Note 2)	Count of Emergences	Count of Defaults
1990			1			1
1991			0			0
1992	73.5%	2	6	73.5%	2	6
1993	100.0%	1	2	100.0%	1	2
1994	100.0%	2	4	100.0%	2	4
1995	92.0%	1	6	92.0%	1	6
1996	61.6%	4	8	61.6%	4	7
1997	79.1%	4	11	72.2%	3	9
1998	72.3%	1	18	72.3%	1	15
1999	84.2%	8	17	81.4%	6	15
2000	77.1%	11	11	77.1%	11	13
2001	100.0%	10	29	100.0%	9	25
2002	78.9%	18	74	74.6%	15	72
2003	76.0%	38	39	75.4%	37	36
2004	80.0%	30	14	77.8%	27	12
2005	80.1%	26	9	80.8%	22	5
2006	82.4%	9	6	80.2%	8	5
2007	89.6%	12	8	87.6%	10	5
2008	79.0%	7	11	79.0%	7	9
2009	70.7%	9	30	67.0%	8	19
2010	100.0%	6	24	100.0%	6	21
2011	84.9%	6	22	84.9%	6	10
2012	70.4%	9	26	55.6%	6	19
2013	49.6%	7	33	49.6%	7	17
2014	81.0%	15	31	69.4%	9	23
2015	37.6%	1	20	37.6%	1	7
Total	**79.5%**	**237**	**460**	**77.3%**	**209**	**363**

Notes:

1) Based on 237 Ultimate Recoveries (BII)

2) Based on 209 Ultimate Recoveries (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

8.3 Distribution of Certain Defaults and Ultimate Recoveries by Region

Exhibit 37 tabulates certain Defaults and Ultimate Recoveries by region. It should be noted that some regions have small sample sizes and the results presented in the Study may change significantly as the Study Data Set is expanded and updated.

EXHIBIT 37

Distribution of Certain Defaults and Ultimate Recoveries by Region

	Basel II Definition of Default					Moody's Definition of Default				
Region	Defaults (Note 1)	Average Years to Default	Defaults (Note 2)	Average Ultimate Recovery Rate (Note 2)	Average Years to Emergence (Note 2)	Defaults (Note 3)	Average Years to Default	Defaults (Note 4)	Average Ultimate Recovery Rate (Note 4)	Average Years to Emergence (Note 4)
Africa	10	3.0	6	61.6%	3.9	7	3.2	6	61.6%	3.5
Asia	57	3.6	39	78.2%	3.6	52	3.8	37	77.0%	3.6
Eastern Europe	8	3.4	3	100.0%	2.3	7	3.4	3	100.0%	2.3
Latin America	55	3.2	25	83.1%	2.6	52	3.2	23	85.7%	2.8
Middle East	6	3.6	4	100.0%	1.8	5	3.5	4	100.0%	1.9
North America	138	3.9	83	77.4%	2.1	118	3.9	74	74.8%	2.2
Oceania	27	3.6	14	86.2%	2.0	24	3.5	14	86.2%	2.0
Western Europe	159	4.7	63	79.5%	1.8	98	4.2	48	73.4%	2.1
Total	**460**	**4.0**	**237**	**79.5%**	**2.4**	**363**	**3.8**	**209**	**77.3%**	**2.5**

Notes:

1) Based on 460 Defaults (BII)

2) Based on 237 Ultimate Recoveries (BII)

3) Based on 363 Defaults (Moody's)

4) Based on 209 Ultimate Recoveries (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

Based on the Basel II definition of default:

» The data shows a broad consistency of average ultimate recovery rates between Latin America, North America, Oceania, Asia and Western Europe, representing a total of 224 out of 237 Ultimate Recoveries (BII) lying in the range of 77.4%-86.2%. Other regions have sample sizes which are too small to support statistically robust conclusions about average ultimate recovery rates.

» The data shows limited variation of average years to default for Latin America, North America, Oceania, Asia and Western Europe, lying in the range of 3.2 to 4.7 years. Other regions have sample sizes which are too small to support statistically robust conclusions about average years to default in each of those regions.

» The data shows a marked variation of average years to emergence from default by region. For Latin America, North America, Oceania, Asia and Western Europe, average years to emergence from default lie in the range of 1.8 to 3.6 years. There appears to be a difference between average years to emergence from default (1) for North America (2.1 years) and Western Europe (1.8 years); and (2) for regions which include a number of developing countries, for example Latin America (2.6 years) and Asia (3.6 years). This difference may be due to differences in institutional structures and legal process between these regions. Other regions have sample sizes which are too small to support statistically robust conclusions about average years to emergence from default in each of those regions.

8.3.1 Distribution of Certain Defaults and Ultimate Recoveries by OECD/non-OECD Countries and World Bank Group Country Classification

Exhibit 38 tabulates certain Defaults and Ultimate Recoveries by OECD/non-OECD countries and World Bank Group Country Classification. Exhibit 38 has been prepared on the basis of the 34 OECD member countries as at 31 December 2015 – the list of OECD members is included in Appendix B (Glossary). World Bank Group Country Classification categorizes countries by their income levels. A more detailed description of the World Bank Group Country Classification is included in Appendix B (Glossary). We note that

observations for low-income economies are very limited and do not allow for statistically significant conclusions.

EXHIBIT 38

Distribution of Certain Defaults and Ultimate Recoveries by OECD/non-OECD Countries

	Basel II Definition of Default					Moody's Definition of Default				
Region	Defaults (Note 1)	Average Years to Default	Defaults (Note 2)	Average Ultimate Recovery Rate (Note 2)	Average Years to Emergence (Note 2)	Defaults (Note 3)	Average Years to Default	Defaults (Note 4)	Average Ultimate Recovery Rate (Note 4)	Average Years to Emergence (Note 4)
World Bank Group Country Classification										
High-income economies	362	4.1	178	80.2%	2.1	280	3.9	154	77.3%	2.2
Upper-middle-income economies	51	3.5	30	80.7%	2.6	42	3.6	28	82.6%	2.6
Lower-middle-income economies	45	3.5	27	72.0%	4.2	39	3.6	25	69.8%	4.1
Low-income economies	2	3.7	2	100.0%	3.2	2	3.4	2	100.0%	3.4
Total	**460**	**4.0**	**237**	**79.5%**	**2.4**	**363**	**3.8**	**209**	**77.3%**	**2.5**
OECD/NON-OECD										
OECD	334	4.2	165	80.0%	2.0	249	4.0	141	76.8%	2.2
NON-OECD	126	3.4	72	78.2%	3.2	114	3.5	68	78.3%	3.2
Total	**460**	**4.0**	**237**	**79.5%**	**2.4**	**363**	**3.8**	**209**	**77.3%**	**2.5**

Notes:

1) Based on 460 defaults (BII)

2) Based on 237 ultimate recoveries (BII)

3) Based on 363 defaults (Moody's)

4) Based on 209 ultimate recoveries (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

Based on the Basel II definition of default:

» The average time to default for projects located in OECD countries is modestly higher than the average time to default for projects located in non-OECD countries.

» The data indicates a broad consistency of average ultimate recovery rates between OECD and non-OECD countries. This result points to the effectiveness of the structural features which characterize project finance and mitigate loss given default (LGD), particularly in emerging market transactions.

» However, based on World Bank Group Country Classification, the data indicates some greater variation of ultimate recovery rates across jurisdictions: Ultimate recovery rates for high-income economies (80.2%) and upper-middle-income economies (80.7%) are consistent with the findings for OECD countries and the total study data average. However, the ultimate recovery rate for lower-middle-income economies is, at 72.0%, slightly below the Study Data average of 79.5%. This result indicates differences in institutional structures and legal processes between countries.

» The data shows also a marked difference between average years to emergence from default (Basel II) for OECD countries (2.0 years) and non-OECD countries (3.2 years) as well as between high-income economies (2.1 years), upper-middle-income economies (2.6 years) and lower-middle-income economies (4.2 years).

8.4 Distribution of Certain Defaults and Ultimate Recoveries by Industry

Exhibit 39 tabulates Ultimate Recoveries by industry. It should be noted that some industry sectors have small sample sizes and the results presented in the Study may change significantly as the Study Data Set is expanded and updated.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis has been withheld at the request of the Data Consortium.

EXHIBIT 39

Average Ultimate Recovery Rate (BII) by Industry

	Average Ultimate Recovery Rate (BII)					
Project Phase	**0%-20%**	**20%-40%**	**40%-60%**	**60%-80%**	**80%-100%**	
Chemicals Production						√
Infrastructure				√		
Leisure & Recreation				√		
Manufacturing				√		
Media & Telecom				√		
Metals & Mining				√		
Oil & Gas				√		
Power						√
Total				√		

Notes:

1) Based on 237 ultimate recoveries (BII)

Source: Moody's Analytics Project Finance Data Consortium

Based on the Basel II definition of default:

- Average ultimate recovery rates differ by industry. Average ultimate recovery rates by industry are disclosed within broad ranges – more detailed information has been withheld at the request of the Data Consortium.
- Ranges of average ultimate recovery rates (BII) by industry are consistent with those reported in the March 2016 study.
- The data shows a divergence of average years to default between industry sectors within a range of 2.6 to 5.3 years. It is perhaps unsurprising that the average time to default differs by industry, since we would expect to see heterogeneous risk exposures and divergence of transaction features across different industries, which reflect the specific characteristics of each industry.
- The data also shows a divergence of average years to emergence from default between industry sectors for Chemicals Production, Infrastructure, Manufacturing, Media & Telecom, Metals & Mining, Oil & Gas, and Power, within a range of 1.4 to 4.5 years. Other industry sectors have sample sizes which are too small to support statistically robust conclusions about average years to emergence in each of those industries.

8.4.1 PPPs

The Study Data Set contains 1,525 projects identified as PPP projects by the Data Consortium, many of which fall within the Infrastructure industry sector. We note, however, that there is some subjectivity in the classification of projects as PPPs.

» The Study Data Set contains 77 defaults (BII) and 43 defaults (Moody's) in the PPP sub-sector.

» The Study Data Set contains 17 Ultimate Recoveries (BII) and 13 Ultimate Recoveries (Moody's) in the PPP sub-sector.

We comment further on our analysis of the PPP sub-sector in Appendix H (Default and Recovery Analysis for PPP projects).

8.5 Distribution of Certain Defaults and Ultimate Recoveries by Construction/Operations Phase

Exhibit 40 tabulates certain defaults and ultimate recoveries, based on whether a loan default occurred during a project's construction or operations phase i.e., whether the default occurred before or after project completion. The Basel II default date was used in the analysis to calculate years to default for projects under the Basel II definition of default; whereas the actual payment default date was used to calculate years to default under the Moody's definition of default.

EXHIBIT 40

Distribution of Defaults and Ultimate Recoveries by Project Phase

	Basel II Definition of Default					Moody's Definition of Default				
Project Phase	Defaults (Note 1)	Average Years to Default (Note 1)	Defaults (Note 2)	Average Ultimate Recovery Rate (Note 2)	Average Years to Emergence (Note 2)	Defaults (Note 3)	Average Years to Default (Note 3)	Defaults (Note 4)	Average Ultimate Recovery Rate (Note 4)	Average Years to Emergence (Note 4)
Construction	74	2.5	37	70.2%	2.9	61	2.6	34	70.3%	3.2
Operations	385	4.3	200	81.2%	2.3	302	4.1	175	78.7%	2.5
Total	**459**	**4.0**	**237**	**79.5%**	**2.4**	**363**	**3.8**	**209**	**77.3%**	**2.6**

Notes:

1) Based on 459 defaults (BII)

2) Based on 237 ultimate recoveries (BII)

3) Based on 363 defaults (Moody's)

4) Based on 209 ultimate recoveries (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

» There is a material difference between (1) the average ultimate recovery rate for construction phase defaults, of 70.2% (BII) and 70.3% (Moody's); and (2) the average ultimate recovery rate for operations phase defaults, of 81.2% (BII) and 78.7% (Moody's). Project finance lenders typically seek loan margins that are higher during the construction phase than during early stage operations i.e., banks often price-in incremental risk during a project's construction phase.

» The data shows a difference between (1) the average years to default from financial close for construction phase defaults, of 2.5 years (BII) and 2.6 years (Moody's); and (2) the average years to default from financial close for operations phase defaults, of 4.3 years (BII) and 4.1 years (Moody's). In theory, we would expect construction phase defaults to cluster around key construction milestones and/or completion dates, as this is when success or failure becomes apparent. Moreover, this may explain why the average years to default for construction phase defaults (2.5 years (BII) and 2.6 years (Moody's)) are consistent with construction programs, which are often scheduled to complete within 2-4 years from financial close. However, the average years to default for projects in operations (4.3 years (BII) and 4.1 years (Moody's)) are surprisingly short. It is possible that some projects have defaulted just shortly after construction completion, or in the initial phase of operations where start-up challenges are common and demand/volumes can turn out to fall substantially short of initial expectations. We include a preliminary analysis of causes of default in Appendix J.

» The data also shows a similarity between the average years to emergence for construction phase Defaults (BII), of 2.9 years and operations phase defaults (BII), of 2.3 years. These results do not entirely align with our expectation that a work out process following a construction phase default would likely be more complex and take longer than a work-out process following an operations phase default. The Study Data Set contains several construction phase projects that defaulted just prior to commercial operations and were subsequently restructured within a very short time frame. These incidents have lowered the average time to emergence for construction phase defaults.

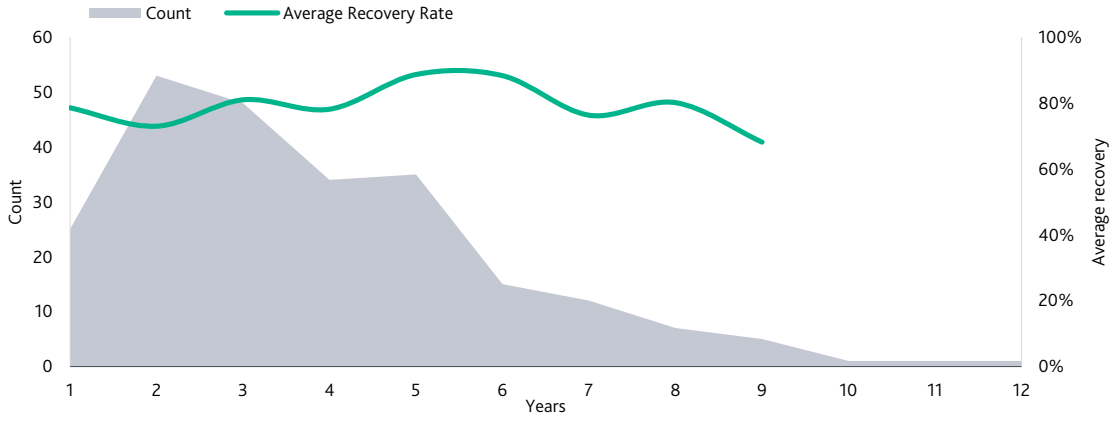
8.6 Average Ultimate Recovery Rates by Number of Years to Default (Basel II Definition of Default)

Exhibit 41 charts average ultimate recovery rates for the 237 Ultimate Recoveries (BII), by time to default.

The Study Data Set shows no discernable relationship between average ultimate recovery rates and when the defaults occurred. In making this observation, we have ignored certain defaults (BII) occurring nine or more years after project origination, since sample sizes are too small to support statistically robust conclusions about average ultimate recovery rates in those years.

EXHIBIT 41

Average Ultimate Recovery Rates by Number of Years to Default (Basel II Definition of Default)



Source: Moody's Analytics Project Finance Data Consortium

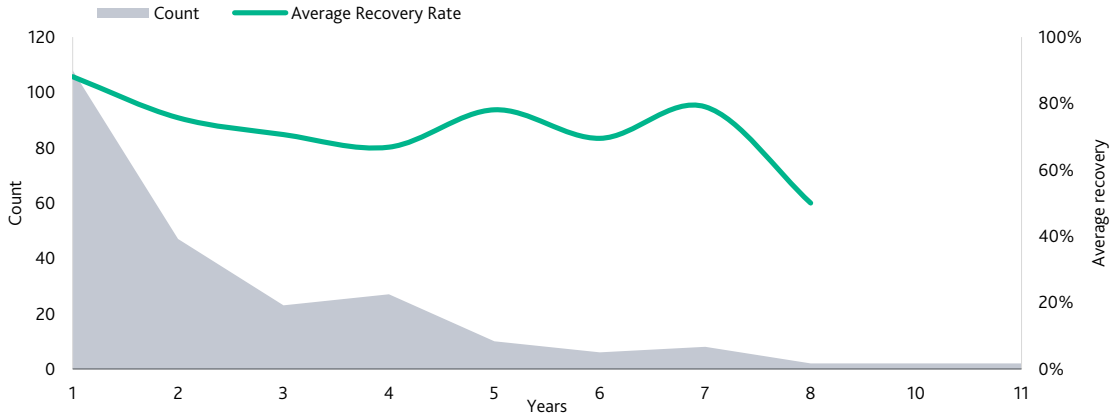
8.7 Average Ultimate Recovery Rates by Number of Years to Emergence (Basel II Definition of Default)

Exhibit 42 charts average ultimate recovery rates for the 237 Ultimate Recoveries (BII), by time to emergence from default.

The data indicates that average ultimate recovery rates are lower for project finance bank loans that take longer to emerge from default. However, the results shown in Exhibit 42 should be interpreted with caution where the number of loans emerging from default after t years spent in default are low (i.e., for t ≥ 8 years)

EXHIBIT 42

Average Ultimate Recovery Rate by Number of Years to Emergence (Basel II Definition of Default)



Source: Moody's Analytics Project Finance Data Consortium

8.8 Cash-out or Work-out?

A key conclusion for the Study Data Set is that the average recovery rate for Ultimate Recoveries, of 79.5% (BII) and 77.3% (Moody's) exceeds the average recovery rate for distressed sales, of 49.8% (BII) and 48.4% (Moody's) (see Exhibit 33).

The data shows that when a lender chooses to realize recoveries from a defaulted loan via a distressed sale, the average economic loss is likely to be substantially greater than if the lender "worked-out" the defaulted loan.

This result is not unexpected since we have observed similar results for corporate bank loans. Indeed, our Ultimate LGD Database shows that ultimate recoveries for loans exceeded the corresponding trading price 30 days after default in most cases. However, there are many reasons why an individual lender may choose to exit from a defaulted loan exposure via a distressed sale rather than participate in a work-out. For example:

» Risk aversion: The work out process carries a number of risks and uncertainties for lenders, including:
  - Uncertainty over the timing of emergence from default following a work-out
  - Uncertainty over the timing and amount of ultimate recovery cash flows
  - Potential exposure to incremental costs or cash calls
  - Potential exposure to liability following assumption of control of a defaulted project
  - Portfolio exposure limits may constrain a lender's ability to work-out multiple defaults simultaneously
» Resource intensive nature of work-outs:
  - The cost of deploying suitably experienced staff to monitor and participate in a work-out process can be considerable.
  - The consumption of senior management and credit oversight time may also be a significant burden.
» Preferences: Time-value of money; Cash flow and accounting impact:
  - Based on an analysis of the likely ultimate recovery prospects and risks, the lender may view a prospective bidder's price as attractive.

- An exit from a defaulted loan position via a distressed sale will accelerate cash flow recoveries, compared to a work-out process. As indicated in Sections 8.3 and 8.4, for the Study Data Set, the average time to emergence from default for Ultimate Recoveries (BII) is 2.4 years, although the timeframe for emergence from default may vary significantly between projects.
- The decision to exit from a defaulted loan position via a distressed sale will almost certainly result in a different P&L impact compared to a work-out process. The significance of this differential P&L impact will depend on the individual lender's circumstances. However, it may give rise to a preference for either exiting via an immediate distressed sale, or deferring such a decision and continuing with the work-out process.

9. Further Analysis of Time to Default and Time to Emergence by Industry

In this section we further examine the relationship between time to default and time to emergence by industry sector.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis has been withheld at the request of the Data Consortium.

10. Exposure at Default

Exposure at Default (EAD) is calculated as the ratio of the amount outstanding at the time of default to the committed exposure at the time of default.

The average EAD for the Study Data Set is 78.5% (BII). Approximately 27.4% of the observations had an EAD of 100%.

Exhibit 51 tabulates Exposure at Default by region.

EXHIBIT 51

Regional Analysis of Exposure at Default

	Basel II Definition of Default		Moody's Definition of Default	
Region	Defaults (Note 1)	EAD	Defaults (Note 2)	EAD
Africa	6	79.9%	6	79.9%
Asia	39	79.3%	37	80.8%
Eastern Europe	3	88.1%	3	88.1%
Latin America	25	67.6%	23	66.2%
Middle East	4	88.8%	4	88.8%
North America	83	79.8%	74	79.0%
Oceania	14	74.2%	14	74.2%
Western Europe	63	80.0%	48	81.0%
Total	**237**	**78.5%**	**209**	**78.4%**

Notes:

1) The data presented above is based on 237 Ultimate Recoveries (BII)

2) The data presented above is based on 209 Ultimate Recoveries (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

Exhibit 52 tabulates Exposure at Default by industry.

EXHIBIT 52

Industry Analysis of Exposure at Default

	Basel II Definition of Default		Moody's Definition of Default	
Industry Sector	Defaults (Note 1)	EAD	Defaults (Note 2)	EAD
Chemicals Production	10	75.2%	10	75.2%
Infrastructure	28	79.9%	23	80.3%
Leisure & Recreation	3	100.0%	3	100.0%
Manufacturing	14	70.4%	14	70.4%
Media & Telecom	38	71.2%	35	71.7%
Metals & Mining	24	78.1%	23	78.9%
Oil & Gas	24	79.7%	22	78.0%
Power	96	81.8%	79	82.0%
Total	**237**	**78.5%**	**209**	**78.4%**

Notes:

1) The data presented above is based on 237 Ultimate Recoveries (BII)

2) The data presented above is based on 209 Ultimate Recoveries (Moody's)

Source: Moody's Analytics Project Finance Data Consortium

11. Appendices

Appendix A: Summary and List of Ultimate Recoveries

Summary of Ultimate Recoveries – by Region and by Industry

In this section we summarize the Study Data Set's 237 Ultimate Recoveries (BII) by region and by industry.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis has been withheld at the request of the Data Consortium.

Appendix B: Glossary

Basel II Framework	"International Convergence of Capital Measurement and Capital Standards: A Revised Framework (Comprehensive Version: June 2006)," published by the Basel Committee on Banking Supervision at http://www.bis.org/publ/bcbs128.htm.
Corporate Bank Loan Data Set	A data set of corporate bank loans (predominantly senior secured) derived from Moody's Ultimate LGD Database, as further described in Appendix D (Comparison of LGD behavior of Project Finance and Corporate Loans).
Cumulative Default Rates	Cumulative default rates are calculated from the weighted average marginal default rates (hazard rates) for all cohorts, based on the methodology described in Section 7.1 (Cohort Analysis: 1990-2015).
Data Consortium	A consortium of leading project finance lenders and investors that provide historical portfolio and credit loss data to Moody's Analytics for the purpose of creating an aggregate data set. For further information see the Notice re Data Consortium on page 74.
Default (BII)	A default based on the Basel II definition of default. We include below, relevant extracts from the Basel II Framework: *452. A default is considered to have occurred with regard to a particular obligor when either or both of the two following events have taken place.* » *The bank considers that the obligor is unlikely to pay its credit obligations to the banking group in full, without recourse by the bank to actions such as realizing security (if held).* » *The obligor is past due more than 90 days on any material credit obligation to the banking group. Overdrafts will be considered as being past due once the customer has breached an advised limit or been advised of a limit smaller than current outstandings.* *453. The elements to be taken as indications of unlikeliness to pay include:* » *The bank puts the credit obligation on non-accrued status.* » *The bank makes a charge-off or account-specific provision resulting from a significant perceived decline in credit quality subsequent to the bank taking on the exposure.* » *The bank sells the credit obligation at a material credit-related economic loss.* » *The bank consents to a distressed restructuring of the credit obligation where this is likely to result in a diminished financial obligation caused by the material forgiveness, or postponement, of principal, interest or (where relevant) fees.* » *The bank has filed for the obligor's bankruptcy or a similar order in respect of the obligor's credit obligation to the banking group.* » *The obligor has sought or has been placed in bankruptcy or similar protection where this would avoid or delay repayment of the credit obligation to the banking group.*
Default (Moody's)	A default based on Moody's definition of default. As discussed further in Appendix E (Comments on certain aspects of Moody's research), Moody's definition of default includes four types of credit events: » A missed or delayed disbursement of a contractually-obligated interest or principal payment (excluding missed payments cured within a contractually allowed grace period), as defined in credit agreements and indentures; » A bankruptcy filing or legal receivership by the debt issuer or obligor that will likely cause a miss or delay in future contractually-obligated debt service payments; » A distressed exchange whereby 1) an obligor offers creditors a new or restructured debt, or a new package of securities, cash or assets that amount to a diminished financial obligation relative to the original obligation and 2) the exchange has the effect of allowing the obligor to avoid a bankruptcy or payment default in the future; or » A change in the payment terms of a credit agreement or indenture imposed by the sovereign that results in a diminished financial obligation, such as a forced currency re-denomination (imposed by the debtor, himself, or his sovereign) or a forced change in some other aspect of the original promise, such as indexation or maturity. Moody's definition of default does not include so-called "technical defaults," such as maximum leverage or minimum debt coverage violations, unless the obligor fails to cure the violation and fails to honor the resulting debt acceleration which may be required. Also excluded are payments owed on long-term debt obligations which are missed due to purely technical or administrative errors which are 1) not related to the ability or willingness to make the payments and 2) are cured in very short order (typically, 1-2 business days). Finally, in select instances based on the facts and circumstances, missed payments on financial contracts or claims may be excluded if they are the result of legal disputes regarding the validity of those claims.
Default In Work-Out (BII)	A default (BII) still in the work-out process.
Default In Work-Out (Moody's)	A default (Moody's) still in the work-out process.
Distressed Sale (BII)	A default (BII) for which a recovery has been realized following a distressed sale of a defaulted loan participation.
Distressed Sale (Moody's)	A default (Moody's) for which a recovery has been realized following a distressed sale of a defaulted loan participation.
Emergence From Default	For a loan which has defaulted, emergence from default is deemed to occur following any of the events set out below: » Repayment of overdue interest. » Restructuring with no subsequent default.

	» Restructuring with lender being taken out of the deal – for example, by repayment of the defaulted loan with no participation in a restructured debt facility. » Material restructuring. » Liquidation.
EAD	Exposure at Default is calculated as the ratio of the amount outstanding at the time of default, to the committed exposure at the time of default.
Industry Data Set	The population of all project finance bank loans originated from 1 January 1983 – 31 December 2015, based on industry data provided by Thomson Reuters Project Finance International.
Marginal Default Rate	The marginal default rate (hazard rate) is the ratio of the number of project defaults in a specific time period divided by the number of projects exposed to the risk of default at the beginning of that time period. For the purposes of this Study, marginal default rates have been calculated on a monthly basis.
Moody's Ultimate LGD Database	Moody's proprietary database which contains information on over 5,200 defaulted loans and bonds taken from over 1,000 non-financial US corporations that initially defaulted since 1987.
OECD	The OECD currently has 35 member countries: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States. This report is based on the 34 member countries the OECD had as of December 31, 2015. Latvia joined the OECD as its 35th member on July 1, 2016.
Project Finance	We reproduce below the Basel II definition of Project Finance: *218. In general, a corporate exposure is defined as a debt obligation of a corporation, partnership, or proprietorship. Banks are permitted to distinguish separately exposures to small- and medium-sized entities (SME), as defined in paragraph 273.* *219. Within the corporate asset class, five sub-classes of specialized lending (SL) are identified. Such lending possesses all the following characteristics, either in legal form or economic substance:* *» The exposure is typically to an entity (often a special purpose entity (SPE)) which was created specifically to finance and/or operate physical assets;* *» The borrowing entity has little or no other material assets or activities, and therefore little or no independent capacity to repay the obligation, apart from the income that it receives from the asset(s) being financed;* *» The terms of the obligation give the lender a substantial degree of control over the asset(s) and the income that it generates; and* *» As a result of the preceding factors, the primary source of repayment of the obligation is the income generated by the asset(s), rather than the independent capacity of a broader commercial enterprise.* *220. The five sub-classes of specialized lending are project finance, object finance, commodities finance, income-producing real estate, and high-volatility commercial real estate. Each of these sub-classes is defined below.* *Project finance* *221. Project finance (PF) is a method of funding in which the lender looks primarily to the revenues generated by a single project, both as the source of repayment and as security for the exposure. This type of financing is usually for large, complex and expensive installations that might include, for example, power plants, chemical processing plants, mines, transportation infrastructure, environment, and telecommunications infrastructure. Project finance may take the form of financing of the construction of a new capital installation, or refinancing of an existing installation, with or without improvements.* *222. In such transactions, the lender is usually paid solely or almost exclusively out of the money generated by the contracts for the facility's output, such as the electricity sold by a power plant. The borrower is usually an SPE that is not permitted to perform any function other than developing, owning, and operating the installation. The consequence is that repayment depends primarily on the project's cash flow and on the collateral value of the project's assets. In contrast, if repayment of the exposure depends primarily on a well-established, diversified, credit-worthy, contractually obligated end user for repayment, it is considered a secured exposure to that end-user...."*
PPP	A public sector procurement structured as a Public Private Partnership. There exists no standard definition of what constitutes a PPP. A PPP is often defined as a long-term contractual agreement between a public sector governmental entity and a private developer to design, build, finance, operate and/or maintain an infrastructure asset for a specific period. The classification of a project as a PPP project in this addendum is based on its classification by the Data Consortium and involves some subjectivity. PPP projects are often referred to as P3 projects or as PFI projects procured under the UK Government's Private Finance Initiative.
Study Data Set	The aggregated data set for the Study, based on data provided by the Data Consortium. The Study Data Set includes 6,389 projects which account for some 62.0% of all project finance bank loans originated globally during a period from 1 January 1983 to 31 December 2015.
Ultimate Recovery (BII)	A default (BII) for which recoveries have been realized following Emergence From Default, as defined above.
Ultimate Recovery (Moody's)	A default (Moody's) for which recoveries have been realized following Emergence From Default, as defined above.

World Bank Group Country Classification	For the fiscal year 2017, the World Bank Group defines low-income economies as those with a gross national income (GNI) per capita of $1,025 or less in 2015; lower-middle-income economies as those with GNI per capita between $1,026 and $4,035; upper-middle-income economies are those with a GNI per capita between $4,036 and $12,475; high-income economies are those with a GNI per capita of $12,476 or more. For a full definition of World Bank Group Country Classification and list of countries by category please see https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups/
Africa	Africa includes projects in Algeria, Angola, Benin, Botswana, Burkina Faso, Cameroon, Chad, Congo, Côte d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Senegal, Sierra Leone, South Africa, and Tanzania
Asia	Asia includes projects in Bangladesh, Brunei, China, Hong Kong, India, Indonesia, Japan, Kazakhstan, Laos, Macau, Malaysia, Mongolia, Myanmar, Pakistan, Papua New Guinea, Philippines, Singapore, South Korea, Taiwan, East Timor, Turkmenistan, Uzbekistan, and Vietnam
Eastern Europe	Eastern Europe includes projects in Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, and the Ukraine
Latin America	Latin America includes projects in Argentina, Bahamas, Bolivia, Bonaire, Brazil, Cayman Islands, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guadeloupe, Guatemala, Guyana, Honduras, Jamaica, Martinique, Netherland Antilles, Panama, Peru, Puerto Rico, St. Maarten, Trinidad and Tobago, Turks and Caicos Islands, Uruguay, Venezuela, and the Virgin Islands
Middle East	Middle East includes projects in Armenia, Azerbaijan, Bahrain, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, and Yemen
North America	North America includes projects in Bermuda, Canada, the United States of America, and Mexico
Oceania	Oceania includes projects in Australia, Guam, Marshall Islands, and New Zealand
Western Europe	Western Europe includes projects in Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Jersey, Luxembourg, Malta, the Netherlands, Norway, Portugal, Scotland, Spain, Switzerland, and the United Kingdom

Appendix C: Overview of Project Finance Characteristics

The Study shows that project finance is a resilient class of specialized corporate lending. The 10-year cumulative default rate for project finance bank loans is consistent with 10-year cumulative default rates for corporate issuers of low investment grade credit quality. The Study also shows that marginal annual default rates improve significantly over time – in particular, marginal annual default rates are consistent with high speculative grade credit quality during an initial three year period following financial close, but fall significantly thereafter, trending towards marginal default rates consistent with single-A category corporate ratings by year seven from financial close.

The Study shows that ultimate recovery rates for the project finance asset class have been consistently high over time, across regions and across industry sectors (although the variation of ultimate recovery rates by industry sector is marked), and that ultimate recovery rates for project finance bank loans are similar to ultimate recovery rates for senior secured corporate bank loans. This observation is despite features such as high gearing and long tenors that are typical for project finance loans, but generally associated with higher risk corporate loans.

While most project finance borrowers are highly leveraged, thinly capitalized special purpose vehicles with limited financial flexibility, project finance loans are structured to be both highly robust to a wide range of potentially severe risks, and to minimize any post-default economic loss. The findings of the Study suggest that the risk allocation, structural features, underwriting disciplines and incentive structures which characterize the project finance asset class have proved effective. We highlight a number of these features below, and discuss their significance in minimizing default risk and loss given default.

Typical Characteristics which Mitigate Default Risk

» Construction risk substantially transferred to a construction contractor through a bespoke turnkey construction contract to deliver a functional asset within an agreed timetable, to a fixed budget, and to meet required performance parameters. Contractor performance risk is typically mitigated through an appropriate incentive structure within the construction contract, including provisions for liquidated damages. Contractor counterparty credit risk would be mitigated as necessary by financial support instruments such as bank letters of credit, or other performance support instruments.

» Predictable, resilient revenue stream over the long term, especially where revenue risk is transferred through an offtake contract that mitigates Project Co's exposure to price risk and demand risk

» Detailed appraisal of whole life operating & maintenance costs, and periodic capital maintenance expenditures

» Covenant structure which controls the scope of the project, underpinning a predictable trajectory for the business of Project Co such that the business cannot evolve outside its pre-agreed core scope

» Protective forward-looking covenants, reserving mechanisms, cash traps and other structural features which mitigate liquidity risk – i.e., Project Co's ability to withstand transient cash flow strain. Project finance transactions are ideally structured to avoid refinancing risk by raising all necessary funding at an initial financial close – however, market tolerance of refinancing risk has evolved differently across geographical markets

» Detailed due diligence by lenders' advisors – e.g., technical advisors, market consultants, legal advisors, insurance advisors, accounting & tax advisors, and/or other advisors as relevant. All concerns raised by lenders' advisors to be addressed to lenders' satisfaction

- Preparation of a detailed financial model based on lenders' base case assumptions and evaluation of the project's resilience to severe downside stress scenarios. The financial model and designated sensitivities would typically be subject to audit prior to financial close
- Detailed appraisal by lenders of all aspects of the project, and negotiation of key terms where relevant to ensure that key risks are identified, allocated and mitigated such that residual risk is within acceptable parameters – i.e., bankable
- Pro-active monitoring by agents, representatives and/or advisors acting on behalf of senior lenders. The scope of information provision by Project Co and monitoring oversight is typically greater than for traditional corporate borrowers. Enhanced reporting and monitoring controls may be triggered by poor technical performance, or weak cash flows

Typical Characteristics which Mitigate Loss Given Default

- Senior secured lenders benefit from first ranking security interests over all material assets, including contractual rights and intellectual property held by Project Co. Such security interests would generally be perfected on or before financial close – i.e., legal, valid, binding and enforceable
- Step-in regime (i.e., step-in, cure, and step-out rights) pre-agreed with Project Co's key contractual counterparties to provide senior secured lenders with appropriate rights and sufficient time to remedy a default by Project Co. Threshold covenants may be triggered before senior lenders actually incur any economic loss
- Pre-agreed intercreditor arrangements, including decision-making and voting procedures which establish senior lender control rights up-front
- Structural mitigation of the risk that other creditor claimants might emerge during a bankruptcy or administration process to challenge pre-agreed intercreditor rights and security interests
- Strategic or essential nature of the project which underpins the project's ongoing profitable operation (although it might well be the case that while a defaulted project is profitable at the operating level it may be unable to meet its debt service obligations in full)
- The project's structure creates incentives for the various stakeholders to mitigate economic loss following a default

Appendix D: Comparison of LGD Behavior of Project Finance and Corporate Loans

We compared corporate bank loan LGD data from our Ultimate LGD Database to the results of the LGD analysis for the Study Data Set.

The corporate recovery data set (the Corporate Bank Loan Data Set) was created using Moody's Ultimate LGD Database, which contains information on over 5,200 defaulted loans and bonds taken from over 1,000 non-financial US corporations that initially defaulted since 1987. Of these defaulted instruments, over 2,000 were defaulted bank loans – and 1,764 of these loans were senior secured. It should be noted that the average ultimate recovery rate for the instruments below represents the average ultimate recovery rate for defaulted debt – it does not represent the average firm-wide ultimate recovery rate for defaulted companies, which would be substantially lower.[16]

The results compare as follows:[17]

EXHIBIT D1

Corporate Debt Ultimate Recovery Rates by Debt Class, 1987-2015

	Emergence Year			Default Year		
Lien Position	2015	2014	1987-2015	2015	2014	1987-2015
Loans	100.0%	83.6%	80.4%	100.0%	79.8%	80.4%
Bonds						
Senior Secured Bonds	81.3%	58.6%	63.3%	77.3%	75.8%	63.3%
Senior Unsecured Bonds	41.8%	50.7%	48.8%	42.8%	33.9%	48.8%

Notes: 2015 Loans' recovery rate is based on 11 observations (by year of default) and 14 observations (by year of emergence). Ten out of 14 loans that emerged in 2015 were not part of distressed exchanges, and hence realized full recovery by definition, and thus contributed to a higher than average overall recovery rate in 2015 (by year of emergence). In case of "by year of default" sample of loans, similarly, 8 out of 11 loans were not restructured in a distressed exchange and realized 100% recovery. Unusually high recoveries of 2015 Sr. Secured bonds stem from a small sample of 8 observations by year of default and 13 by year of emergence. These debt instruments were parts of only 6 defaults and 9 default resolutions last year. In both cases samples consisted of mainly distressed exchanges and prepackaged bankruptcies, which on average result in higher recovery rates for investors.

Source: Moody's Investors Service

EXHIBIT D2

Ultimate Recovery Rates – Corporate Bank Loan Data Set Compared to the Study Data Set, 1987-2015

Data Set	Average Recovery	Standard Deviation
Corporate Bank Loan Data Set (All Loans)	80.5%	30.5%
Corporate Bank Loan Data Set (Senior Secured Loans)	84.6%	26.3%
Study Data Set (Basel II Definition Of Default)	79.5%	33.7%
Study Data Set (Moody's II Definition Of Default)	77.3%	34.8%

Note: Exhibit D1 is taken from Moody's Special comment "Corporate Default and Recovery Rates, 1990-2015", published February 2016. Exhibit D2 reflects the corporate bank loan data set as of December 31, 2015, which explains small rounding differences between reported recovery rate for the corporate bank loan data set in both exhibits.

Source: Moody's Investors Service

[16] As stated in Moody's Special Comment "Lessons from 1,000 Corporate Defaults" November 2011, for 1988-2011, the average firm-wide ultimate recovery rate for defaulted companies was 54.5%

[17] See Moody's Special Comment "Corporate Default and Recovery Rates, 1920-2015," February 2016

The senior secured loans within the Corporate Bank Loan Data Set averaged a recovery of 84.6% (versus 80.5% for all loans) between 1987-2015 so it would appear that the average ultimate recovery rates for project finance bank loans and for senior secured corporate bank loans are similar.

However, the Study shows that ultimate recovery rates for project finance loans are substantially uncorrelated with a number of factors which are key determinants of ultimate recovery rates for corporate debt facilities:

» We have stated in previous research on corporate debt that two of the most important variables in determining recovery rates of defaulted debt are the legal jurisdiction of a defaulted company and its debt structure. We comment below on the influence of these factors on ultimate recovery rates for both data sets.

» We also discuss below a significant emerging factor affecting recovery rates for defaulted corporate debt: type of default.

» We have stated in previous research on corporate debt that default rates are negatively correlated with recovery rates. We comment further below on the correlation of default rates and recovery rates.

Impact of Legal jurisdiction

Although the legal jurisdiction of a defaulted company is an important determinant of recovery rates for corporate debt, the results of the Study do not provide clear support that the legal jurisdiction of a project's host country is a key determinant of recovery rates for project finance bank loans. Classification according to World Bank Group country income categories suggests that average ultimate recovery rates in lower-middle-income economies are modestly below those of countries with a higher income level and below the Study Data average. However, Exhibit 38 shows that average ultimate recovery rates (BII) for OECD and non-OECD countries are similar and consistent with the Study Data average.

For project finance transactions, project documentation and onshore security arrangements will typically be governed by local law, while finance documentation and offshore security arrangements will typically be governed by New York law or English law. Exhibit 37 (Distribution of certain Defaults and Ultimate Recoveries by region) shows a broad consistency of average ultimate recovery rates (BII) for Latin America, North America, Oceania, Asia and Western Europe (representing a total of 224 out of 237 Ultimate Recoveries (BII) lying in the range of 78.2%-86.2%).

Impact of Debt Structure

While debt structure is an important determinant of recovery rates for corporate debt, for the reasons set out below it is less significant for project finance transactions.

The 2,084 loans in the Corporate Bank Loan Data Set have an average "debt cushion" (debt contractually subordinated to the bank debt as a percentage of total debt) of 46.2%. This debt cushion enhances average ultimate recovery rates for senior lenders to corporates to levels similar to average ultimate recovery rates for the Study Data Set.

The importance of debt structure in determining recovery rates for corporate debt was emphasized in Moody's Special Comment "Lessons from 1000 Corporate Defaults" published in November 2011:

"The average firm-wide recovery for the entire database of 1,000 defaults was 54.5%. Around that figure is a wide range of average instrument-level recoveries, from 80.4% for bank debt to 28.8% for subordinated bonds. This clearly illustrates the significance of an instrument's location in a company's capital structure and the amount of subordinated debt beneath it that can take first losses. "

At its simplest, the funding structure for a project finance transaction will comprise one or more pari passu senior secured debt facilities and sponsor equity. For complex international project financings, pari passu senior secured debt facilities might be raised from a number of different sources (e.g., commercial banks, one or more export credit agencies, and/or a project bond). Potentially, subordinated secured debt facilities might also be raised from third-party funders. Although sponsor funding might also be provided in the form of deeply subordinated unsecured debt rather than in the form of share capital, such debt facilities would generally be regarded as quasi-equity. Hence, typical project finance transactions would have no more than two layers of debt at most – i.e., senior secured debt facilities and third-party subordinated secured debt facilities.

Where third-party subordinated secured debt is raised, intercreditor arrangements are typically such that the security interests and intercreditor rights of subordinated secured funders are deeply subordinated and these creditors should not be able to materially or adversely impact the ability of senior secured creditors to enforce their first ranking security interests and exercise their own intercreditor rights. Accordingly, the presence of third-party deeply subordinated debt should not materially impact on the project's senior secured debt capacity, nor should it materially affect the default and recovery experience of senior secured lenders. In other words, third-party subordinated debt in project finance transactions typically provides no beneficial debt cushion to senior secured funders. We note, however, that the presence of subordinated debt on terms which are less than deeply subordinated may actually increase default risk and erode recovery performance for senior secured lenders.

Impact of Default Type

Moody's definition of default includes the following types of default events:

- A missed or delayed disbursement of a contractually-obligated interest or principal payment (excluding missed payments cured within a contractually allowed grace period), as defined in credit agreements and indentures
- A bankruptcy filing or legal receivership by the debt issuer or obligor that will likely cause a miss or delay in future contractually-obligated debt service payments
- A distressed exchange whereby 1) an obligor offers creditors a new or restructured debt, or a new package of securities, cash or assets that amount to a diminished financial obligation relative to the original obligation and (2) the exchange has the effect of allowing the obligor to avoid a bankruptcy or payment default in the future
- A change in the payment terms of a credit agreement or indenture imposed by the sovereign that results in a diminished financial obligation, such as a forced currency re-denomination (imposed by the debtor, himself, or his sovereign) or a forced change in some other aspect of the original promise, such as indexation or maturity

Moody's definition of default does not include so-called "technical defaults," such as maximum leverage or minimum debt coverage violations, unless the obligor fails to cure the violation and fails to honor the resulting debt acceleration which may be required. Also excluded are payments owed on long-term debt obligations which are missed due to purely technical or administrative errors which are (1) not related to the ability or willingness to make the payments; and (2) are cured in very short order (typically, 1-2 business days). Finally, in select instances based on the facts and circumstances, missed payments on financial contracts or claims may be excluded if they are the result of legal disputes regarding the validity of those claims.

In our Special Comment "After Black Swans, Now What?" published in May 2010 we commented:

"Distressed exchanges and prepackaged bankruptcies tend to produce higher corporate-level recoveries than other types of defaults. Syndicated project finance where less than half of the defaults in the bank group data are bankruptcies is an example of an asset class with a long history of employing distressed exchanges and other restructurings, as opposed to regular bankruptcy, and it has enjoyed recovery rates as good as, if not stronger than, those seen in syndicated corporate finance. In the corporate arena, we're seeing more non- traditional Chapter 11 defaults executed by private equity. In fact, a little more than half of U.S. non-financial corporate defaults in 2009 had the involvement of private equity owners, and these defaulted sponsored transactions had a higher incidence of distressed exchanges and prepackaged bankruptcies than the defaults of companies without private equity backing. We can assume this behavior will continue as long as it can be demonstrated that both the sponsors and the holders of senior debt benefit more than they would from a traditional bankruptcy".

This development in corporate lending is already hard-wired into project finance transactions, as discussed in Appendix C (Overview of Project Finance Characteristics). For example, the following features are examples of key creditor protections/characteristics typically structured into project finance transactions, which facilitate the proactive management of defaulted credits by senior creditors seeking to maximise their recoveries:

» Senior secured lenders benefit from first ranking security interests over all material assets, including contractual rights and intellectual property held by Project Co. Such security interests would generally be perfected on or before financial close – i.e., legal, valid, binding and enforceable

» Step-in regime (i.e., step-in, cure, and step-out rights) pre-agreed with Project Co's key contractual counterparties to provide senior secured lenders with appropriate rights and sufficient time to remedy a default by Project Co

» Pre-agreed intercreditor arrangements, including decision-making and voting procedures which establish senior lender control rights up-front

» Structural mitigation of the risk that other creditor claimants might emerge during a bankruptcy or administration process to challenge pre-agreed intercreditor rights and security interests

» Strategic or essential nature of the project underpins the project's ongoing profitable operation (although a project which is profitable at the operating level may not be able to meet its debt service obligations in full)

We followed up on our observations of May 2010 with the following commentary included in our Special Comment "Lessons from 25 Years of Chapter 22" published in December 2012:

"While Chapter 22s (a Chapter 11 bankruptcy filing followed by another Chapter 11 filing) were most prevalent between 1988 and 2011, during the Great Recession the most prevalent re-default scenario was a distressed exchange followed by a Chapter 11 filing. If these distressed exchanges were preemptive efforts by private equity owners or company managements to control the default process and maximise owners' equity, they did not work. This gives us early evidence that at least some distressed exchanges during the Great Recession did not provide sufficient capital restructuring, and raises the specter of re-defaults among companies that defaulted for the first time during the crisis."

Correlation of Default Rates and Recovery Rates

In Moody's Special Comment: "Syndicated Bank Loans: 2008 Default Review and 2009 Outlook," March 2009, we note that default rates for corporate bank loans are negatively correlated with recovery rates.[18]

[18] The relationship between default rates and recovery rates on corporate debt facilities has been in Moody's research, as well as external research. A negative correlation between default rates and recovery rates is consistent with the hypothesis that a larger supply of defaulted debt depresses the ultimate recovery and the

In contrast, ultimate recovery rates (BII) for the Study Data Set appear to be substantially independent of both the economic cycle at default and the economic cycle at emergence. In particular, Exhibit 35 (Average recovery rates for Ultimate Recoveries (BII) by year of emergence) shows that:

» With the exception of 2013 (for which the average ultimate recovery rate (BII) for 2013, of 49.6% appears to be unusually low), average ultimate recovery rates (BII) for project finance bank loans emerging from default between 1999-2014 were in the range of 70.4%-100.0%.

» Other than 2013, average ultimate recovery rates 1999-2014 show substantial independence from the incidence of defaults.

» Similarly, average ultimate recovery rates 1999-2014 show substantial independence from the incidence of projects emerging from default.

» We exclude calendar years prior to 1999 from our analysis on the basis that the number of projects emerging from default in each of those years is relatively small.

Summary

The average ultimate recovery rates for project finance bank loans and for senior secured corporate bank loans are similar. However, further review suggests that the two asset classes rely on different means to achieve robust recovery rates. While corporate lenders rely predominantly on debt cushion, project finance lenders focus on the proactive management of defaulted credits, facilitated by comprehensive creditor-friendly structural features which are a key characteristic of project finance.

We summarize key points of comparison below, but would observe that our analysis shows that project finance is a resilient class of specialized corporate lending, displaying high ultimate recovery rates which are substantially uncorrelated with a number of factors that are key determinants of ultimate recovery rates for general corporate debt facilities:

» Our research on corporate debt has previously found that the legal jurisdiction of a defaulted company is an important determinant of ultimate recovery rates for defaulted debt. The results of the Study provide mixed results with respect to the importance of the legal jurisdiction of a project's host country as a determinant of ultimate recovery rates for project finance bank loans. Classification by OECD/non-OECD countries shows no variation of recovery rates across these two country classifications. However, categorizing countries by income level according to the World Bank Group Country Classification reveals some variation in ultimate recovery rates in particular for the subset of lower-middle-income economies.

» Our research on corporate debt has previously found that the debt structure of corporate loans (i.e., the presence of debt contractually subordinated to senior lenders) is an important determinant of ultimate recovery rates for defaulted senior loans to corporate borrowers. For project finance loans, we consider that the credit quality of senior secured project finance loans is typically structured to be substantially independent of the presence (or absence) of deeply subordinated debt.

» Our research on corporate debt has found that negotiated restructurings following a corporate default tend to produce higher ultimate recovery rates than a regular bankruptcy. This behavior, facilitated by creditor-friendly structural features, is already prevalent in project finance.

» Our research on corporate debt has previously found that ultimate recovery rates are negatively correlated with default rates. For the Study Data Set, ultimate recovery rates appear to be substantially independent of both the economic cycle at default and the economic cycle at emergence.

prices of such defaulted debt. For further background discussion, see Moody's Special Comment Syndicated Bank Loans: 2008 Default Review and 2009 Outlook," March 2009.

Appendix E: Comments on Certain Aspects of Moody's Research

Default Rate Calculations

The default analysis undertaken in the Study is based on the Basel II definition of default. In addition, the Study also provides comparable results based on Moody's definition of default. Moody's standard definition of default differs from the Basel II definition of default. We set out below Moody's definition of default, and comment on the impact of applying Moody's default definition on the results and observations described within this Study.

Moody's Definition of Default

» Moody's definition of default is applicable only to debt or debt-like obligations (e.g., swap agreements). Four events constitute a debt default under Moody's definition:

» A missed or delayed disbursement of a contractually-obligated interest or principal payment (excluding missed payments cured within a contractually allowed grace period), as defined in credit agreements and indentures;

» A bankruptcy filing or legal receivership by the debt issuer or obligor that will likely cause a miss or delay in future contractually-obligated debt service payments;

» A distressed exchange whereby (1) an obligor offers creditors a new or restructured debt, or a new package of securities, cash or assets that amount to a diminished financial obligation relative to the original obligation; and (2) the exchange has the effect of allowing the obligor to avoid a bankruptcy or payment default in the future; or

» A change in the payment terms of a credit agreement or indenture imposed by the sovereign that results in a diminished financial obligation, such as a forced currency re-denomination (imposed by the debtor, himself, or his sovereign) or a forced change in some other aspect of the original promise, such as indexation or maturity.

Moody's definition of default does not include so-called "technical defaults," such as maximum leverage or minimum debt coverage violations, unless the obligor fails to cure the violation and fails to honor the resulting debt acceleration which may be required. Also excluded are payments owed on long-term debt obligations which are missed due to purely technical or administrative errors which are (1) not related to the ability or willingness to make the payments; and (2) are cured in very short order (typically, 1-2 business days). Finally, in select instances based on the facts and circumstances, missed payments on financial contracts or claims may be excluded if they are the result of legal disputes regarding the validity of those claims.

Basel II Definition of Default

We reproduce the Basel II definition of default in Appendix B (Glossary). In broad terms, the Basel II definition of default not only captures the events which are included in Moody's definition of default, but also captures a wider range of defaults, including circumstances in which the reporting bank considers that the obligor is unlikely to pay its credit obligations in full. For example, under the Basel II definition, defaulted credits would also include debt obligations where:

» The bank puts the credit obligation on non-accrued status.

» The bank makes a charge-off or account-specific provision resulting from a significant perceived decline in credit quality subsequent to the bank taking on the exposure.

In theory therefore, the number of defaults reported under the Basel II definition might differ materially from the number of defaults considered to have occurred under Moody's definition of default.

Impact: Moody's Default Definition vs. Basel II Default Definition

As described at Section 4.4 above, we reviewed the individual circumstances of each reported loan default against the Basel II definition of default and Moody's definition of default.

Results based on the Basel II definition of default and comparative results based on Moody's definition of default have been included throughout the Study.

In summary:

» The Study Data Set contains 460 Defaults (BII) and 363 Defaults (Moody's).
  - Cumulative default rates under the Basel II definition of default are slightly higher than comparative cumulative default rates calculated under Moody's definition of default (see Exhibit 13)
  - Marginal default rates under the Basel II definition of default are slightly higher than comparative marginal default rates calculated under Moody's definition of default (see Exhibit 15)

» The Study Data Set contains 237 Ultimate Recoveries (BII) and 209 Ultimate Recoveries (Moody's).
  - The average ultimate recovery rate under the Basel II definition of default (79.5%) is slightly higher than the average ultimate recovery rate under Moody's definition of default (77.3%) (see Exhibit 33)

» The results summarized above are directionally consistent with the fact that the Basel II definition of default is broader than Moody's definition of default. We would expect the Basel II definition of default to result in a greater number of defaults with a higher average ultimate recovery rate, than under Moody's definition of default.

Recovery Rate Calculations

The calculation of recovery rates in the Study is dependent on the definition of emergence from default. The definition of emergence from default used in the Study has been adopted at the request of the Data Consortium.

We highlight that the determination of recovery rates in Moody's Special Comment "Default and Recovery Rates for Project Finance Debts, 1992-2008," published in November 2009 is based on 30-day post-default trading prices rather than ultimate recovery values. The use of post-default trading prices to measure recovery is common practice in the credit default swaps market. In our view, recovery rates measured in this way are most relevant for bond investors who liquidate their holdings shortly after default, as often required by their portfolio governance rules, or their own investment objectives.

We contrast this with the focus on ultimate recovery rates in the Study, and highlight the material difference between average recovery rates for recoveries for Ultimate Recoveries and Distressed Sales – Section 8.1 (Distribution of Ultimate Recovery Rates) refers.

We comment further on the predictive content of 30 day post-default trading prices as measures of ultimate recovery in our Special Comment: "Trading Prices as Predictors of Ultimate Corporate Recovery Rates," published in March 2012.

Implications for the Calibration of Moody's Sector Ratings

» Our ratings represent a rank-ordering of creditworthiness, or expected loss – which is a function of the probability of default and the expected severity of loss given a default. The Study provides evidence of

the default and recovery performance of a large sample of project finance debt obligations over an extended period. We consider the results of the Study to be insightful in the context of enhancing the accuracy and calibration of our own ratings. However, as we assess the potential impact of the Study's results on our ratings, we are also mindful of the following considerations:

» The standard deviation of the Study Data Set's ultimate recovery rates is 33.7% (BII) and 34.8% (Moody's) i.e., relatively large.

» For consistency with our recovery research and findings for other sectors, Moody's will consider distressed sales as well as ultimate recoveries.

» Behavioral drivers for bank lenders tend to differ from those of bond investors.

» The past does not necessarily predict the future because default rates and recovery rates may change over time. For example, there may be changes to exogenous risk factors such as legal framework and market environment, and to endogenous variables such as project characteristics and structural features.

We also note that tenors of 20-30 years (or longer) are common within project finance, especially PPPs. While the time period covered by the Study is long relative to most corporate loans, it is short relative to the typical tenor for project finance loans. Many loans within the Study Data Set have yet to reach final maturity. This limits our ability to assess any changes in default or recovery which may emerge as these loans reach maturity, since exposure to lifecycle risk and costs, or risks in meeting minimum handback requirements, may be significant.

Special Comment "Infrastructure Default and Recovery Rates, 1983-2015"

We highlight our Special Comment: "Infrastructure Default and Recovery Rates, 1983-2015," July 2016 which reported on the historical performance of long-term infrastructure debt (including project finance debt) rated by Moody's.

"This study is an update to our previous publication, "Infrastructure Default and Recovery Rates, 1983-2014," published in March 2015, and focuses on the credit and ratings performance of Moody's-rated infrastructure universe from 1983-2015.

Our main findings are:

» *In the aggregate, infrastructure debts are less likely to incur credit losses than non-financial corporate (NFC) issuers, especially over longer horizons. On average, a total infrastructure debt security loses 0.3% of its face value over a five-year horizon and 0.4% of its face value over a ten-year horizon, compared to 6.0% and 8.9%, respectively, for a typical NFC issuer.*

» *Being assessments of expected loss, Moody's infrastructure ratings are predominantly investment-grade. As of year-end 2015, 92% of total infrastructure ratings held an investment-grade rating, compared to 41% for NFC issuer ratings.*

» *Infrastructure ratings are more stable than NFC ratings, driven in large part by the US municipal infrastructure sector. On average, ratings on total infrastructure securities have been 40% as volatile as NFC ratings. The corresponding figures for ratings on US municipal infrastructure securities and corporate infrastructure and project finance securities are 19% and 84%, respectively.*

» *Credit loss rates for single-A and Baa-rated corporate infrastructure and project finance debt securities and NFC issuers are similar through a five-year horizon. Default rates for both single-A and Baa-rated corporate infrastructure and project finance debt securities are higher than NFC issuers up through a five-year horizon. However, corporate infrastructure and project finance debt securities suffer lower losses given default than NFC issuers, resulting in similar loss rates through a five-year horizon.*

» *As measured by the Average Defaulter Position (AP), Moody's corporate infrastructure and project finance debt ratings are as accurate as NFC issuer ratings over one- and three-year horizons. The average one-year (three-year) AP for corporate infrastructure and project finance debt securities was 90.9% (85.9%) versus 89.6% (86.6%) for NFC issuers."*

Special Comment "Default and Recovery Rates for Project Finance Bank Loans, 1983–2014 Addendum"

We highlight our Special Comment: "Default and Recovery Rates for Project Finance Bank Loans, 1983-2014 Addendum", September 2016 which published additional information about the performance of infrastructure projects (based on a broader definition of the Infrastructure industry sector). Key findings included:

» ***Credit stress moderated in 2014.*** *There were six defaults in Broad Infrastructure Project Finance in 2014, less than half of the average annual default count for 2009-13. Defaults in 2014 were concentrated in Western European transportation projects.*

» ***Marginal default rates for Broad Infrastructure Project Finance and its three subsets tend to decline over time from financial close****. Marginal default rates, a measure of the likelihood that a performing obligor at the start of a year will default in that year, also remained lower than the average marginal default rate for the Study Data Set for 1983-2014 (see glossary).*

» ***Marginal default rates for Broad Infrastructure Project Finance and public-private partnerships (PPP), on average, track borderline investment-grade corporates in the first years after financial close.*** *Marginal default rates are similar to those for borderline investment-grade corporate issuers for the first four years after financial close. They are consistent with marginal default rates for corporate issuers rated Baa3 or higher thereafter.*

» ***Availability-based projects and availability-based PPP projects incur lower credit losses on average than the Broad Infrastructure Project Finance cohort.*** *The marginal default rates of these projects are comparable to the marginal default rates of corporate issuers rated Baa3 or higher at all durations and to single A-rated corporate issuers by year three from financial close.*

» ***Average ultimate recovery rates are consistent with the 80.4% average among the entire Study Data Set for 1983-2014****. Excluding a single outlier with a 100% write-off, average ultimate recovery rates for all subsets exceed the average of the Study Data Set.*

» ***Ultimate recovery rates for the majority of defaults are still unknown*** *because most have yet to emerge from default. Data on ultimate recovery rates are available for nearly 30% of all defaults in the Broad Infrastructure Project Finance subset.*

Special Comment "Default and Recovery Rates for Project Finance Bank Loans, 1983-2014: Project Type and Jurisdiction Matter"

We highlight our Special Comment: "Default and Recovery Rates for Project Finance Bank Loans, 1983-2014: Project Type and Jurisdiction Matter", January 2017.

In the report we examine whether a project's location, based on the World Bank Group's country classification, affects credit performance. We also investigate the difference between the credit performance of social infrastructure projects and economic infrastructure projects (for which purpose we have adopted the definitions of social infrastructure and economic infrastructure in the WEF's report "Strategic Infrastructure - Steps to Prioritize and Deliver Infrastructure Effectively and "Efficiently", September 2012).

Our key findings are:

- ***Project jurisdiction affects default risk in the initial years of the project**. In the first five years from financial close, annual marginal default rates for project finance bank loans tend to be highest in lower-middle-income economies, followed by upper-middle-income economies, and lowest in high-income economies.*
- ***Distinction in marginal default rates by country classification diminishes by year six from financial close**. Jurisdiction tends be a less critical driver of default risk once a project has started to build an operating track record.*
- ***Average ultimate recovery rates show a degree of variation by country classification**.*
- ***Social infrastructure project finance bank loans exhibit substantially lower cumulative and marginal default rates than economic infrastructure projects and the study data average**.*
- ***The average recovery rate for economic infrastructure projects (84.4%) is consistent with the study data average of 80.4**%. Empirical data on recovery rates for social infrastructure projects is limited given a small number of projects that have emerged from default.*

Appendix F: Potential Scope of Work for Follow-on Research

We look forward to publishing further research based on an expanded and updated data set. However, we note that the results of a future study based on a different data set will necessarily be different.

The following list indicates the potential scope of work for follow-on research:

- Further analysis of the impact of economic cycle on default and recovery experience
- Further analysis of the impact of jurisdiction on default and recovery experience
- Further analysis of facility level recoveries
- Default and recovery analysis for ECA-backed or ECA-insured facilities
- Default and recovery analysis for projects in certain regions, such as the countries within the Gulf Cooperation Council region
- Analysis of 15-year, 20-year cumulative default rates
- Analysis of default and recovery performance over different time intervals

Appendix G: Default and Recovery Analysis for Power Projects

In this appendix we examine historic default and recovery behavior for key sub-sectors within the Power industry sector, including Renewable Power Generation.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis has been withheld at the request of the Data Consortium.

Appendix H: Default and Recovery Analysis for PPP Projects

In this appendix we examine historic default and recovery behavior for PPP projects within the Study Data Set.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis has been withheld at the request of the Data Consortium.

Caveat: The observations noted below for projects identified as PPP projects should be interpreted with caution, since (1) there is some subjectivity in the classification of projects as PPPs; and (2) the number of defaults is relatively small.

The Study Data Set contains 1,525 projects identified as PPP projects with 77 Defaults (BII), 17 Ultimate Recoveries (BII) and 9 Distressed Sales (BII).

» The 10-year cumulative default rate (BII) is 5.2%, which has modestly increased from the 3.9% (BII) default rate reported in the March 2016 study, as additional data was added to the study data set. The 10-year cumulative default rate is modestly higher than the 10-year cumulative default rate for corporate issuers in the Baa ratings category of 3.8%.[19]

» The 10-year cumulative default rate (BII) of 5.2% is slightly lower than the 10-year cumulative default rate (BII) for the Infrastructure industry sector of 5.8%, and lower than the 10-year cumulative default rate (BII) for the Study of 6.7%.

» Marginal annual default rates (BII) are broadly stable and are borderline investment grade, falling in between marginal default rates for Baa and Ba rated corporate issuers, for the initial four years post financial close, and decline thereafter to marginal annual default rates consistent with those of corporate issuers in the Baa ratings category or better (see Exhibit H8).

» The average ultimate recovery rate is 85.5% (BII) and falls within a range from 0%-100%, with a standard deviation of 26.3%. The average ultimate recovery rate for the PPP sub-sector is similar to the average ultimate recovery rate of 79.5% (BII) for the full Study Data Set.

» All 17 recoveries were in the Infrastructure industry sector, specifically roads, rail, healthcare, education, environmental and civil defense and leisure – 11 of the recoveries were in Western Europe, 2 in Oceania, 1 in Eastern Europe, 1 in North America and 2 in Southeast Asia.

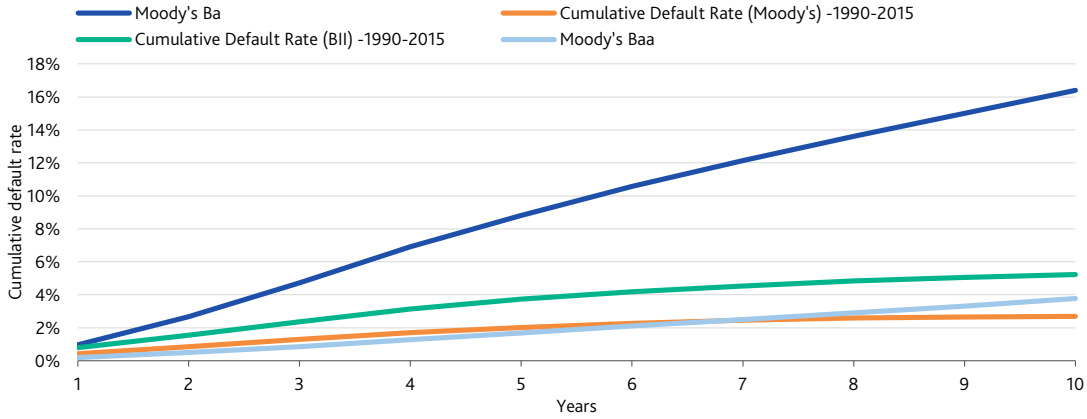
» These results provide some evidence to support the view held by many market participants that PPP is a discrete sub-sector lying at the low-risk end of the project finance spectrum.

[19] The comparative 10-year cumulative default rate for the Baa3 rating category is 5.4% (see Exhibit 35 of Moody's Special Comment "Corporate Default and Recovery Rates, 1920-2015" February 2016)

Exhibit H6 charts cumulative default rates for the PPP sub-set within the Study Data Set. For comparison, we have included cumulative default rate data derived from Moody's published research on default and recovery rates for corporate bond and loan issuers rated in the Baa and Ba rating categories:[20]

EXHIBIT H6

Cumulative Default Rates for PPP Projects

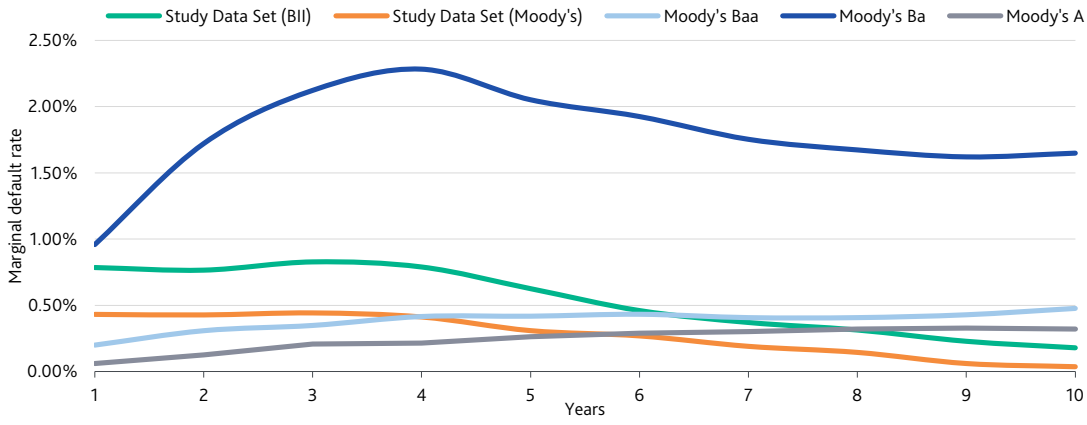


Source: Moody's Analytics Project Finance Data Consortium

Exhibit H8 charts marginal annual default rates for the PPP sub-set within the Study Data Set. For comparison, we have included marginal annual default rate data derived from Moody's published research on default and recovery rates for corporate bond and loan issuers rated in the single-A, Baa and Ba rating categories:[21]

EXHIBIT H8

Marginal Annual Default Rates for PPP Projects



Source: Moody's Analytics Project Finance Data Consortium

[20] See Moody's Special Comment: "Corporate Default and Recovery Rates, 1920-2015"

[21] See Moody's Special Comment: "Corporate Default and Recovery Rates, 1920-2015"

Appendix I: The Impact of Causes of Default on Default and Recovery Experience

In this appendix we examine the impact of causes of default on default and recovery experience.

Data was analyzed to determine the primary cause of default and categorized into the following categories:

1. Defaults primarily due to construction risk:
Includes defaults caused by construction schedule delays, construction cost overruns, delays in the commencement of operations, failure to complete construction works to achieve minimum acceptance criteria, construction contractor default or non-performance, or the failure or inadequacy of financial or performance supports intended to mitigate construction risk

2. Defaults primarily due to counterparty credit or performance risk:
Includes defaults caused by default or non-performance of key counterparty obligors under principal project contracts, e.g. offtake agreement, fuel supply agreement, feedstock supply agreement, maintenance agreement, sponsor support agreement. Excludes construction-related defaults categorized at #1 above

3. Defaults primarily due to market risk:
Includes defaults caused by adverse variances in price and volume assumptions e.g., lower than expected output commodity prices; higher than expected input commodity prices; or lower than projected traffic volumes/demand/usage/patronage

4. Defaults primarily due to operational performance risk:
Includes defaults caused by weak operational performance, cost overruns or technical problems during the operations phase. For the purpose of this analysis, we also include in this category defaults arising from reserves risk (e.g., in relation to an oil & gas production project) or resource risk (e.g., in relation to a wind power project)

5. Defaults primarily due to country risk:
Includes defaults caused by currency transfer or convertibility constraints, local currency devaluation, expropriation, imposition of discriminatory taxation or regulation, contract repudiation by a sovereign entity, political force majeure, or war & civil disturbance

6. Other causes of default:
Defaults for reasons other than categories 1-5 above

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis within this section has been withheld at the request of the Data Consortium.

Appendix J: The Impact of Market Risk on Default and Recovery Experience

In this appendix we examine the impact of the components of market risk on default and recovery experience.

Defaults primarily due to market risk include defaults caused by adverse variances in price and volume assumptions e.g., lower-than-expected output commodity prices; higher than expected input commodity prices; or lower than projected traffic volumes/demand/usage/patronage.

Defaults due to market risk were further analyzed by Price Risk and Volume/Demand Risk.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis within this section has been withheld at the request of the Data Consortium.

Appendix K: The Impact of Project Size on Default and Recovery Experience

In this appendix we examine the impact of project size on default and recovery experience.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis within this section has been withheld at the request of the Data Consortium.

Appendix L: Expected Loss

In this appendix we report on expected losses and expected loss rates.

This Sector In-depth Report is an abridged version of a more comprehensive study undertaken using data provided by the Data Consortium. Publication of certain analysis within this section has been withheld at the request of the Data Consortium.

12. Moody's Related Research

Cross-Sector Rating Methodology:

» Moody's Approach to Evaluating Distressed Exchanges, March 2009 (115337)

Default Research:

» Default and Recovery Rates for Project Finance Bank Loans, 1983-2014, March 2016 (1018664)

» Default and Recovery Rates for Project Finance Bank Loans, 1983-2014 Addendum, September 2016 (1034771)

» Default and Recovery Rates for Project Finance Bank Loans, 1983-2014: Project Type and Jurisdiction Matter, January 2017 (1047555)

» Annual Default Study: Corporate Default and Recovery Rates, 1920-2015, February 2016 (1018455)

» Infrastructure Default and Recovery Rates, 1983-2015, July 2016 (1030987)

» US Corporate Default and Recoveries: Lessons from 25 Years of 'Chapter 22', December 2012 (147863)

Other Special Comments:

» Trading Prices as Predictors of Ultimate Corporate Recovery Rates, March 2012 (139896)

» Moody's Ultimate Recovery Database: Lessons from 1,000 Corporate Defaults, November 2011 (137405)

» Hard Data for Hard Times, July 2010 (126338)

» After Black Swans, Now What?, May 2010 (124964)

» Default and Recovery Rates for Project Finance Debts, 1992-2008, November 2009 (120845)

» Syndicated Bank Loans: 2008 Default Review and 2009 Outlook, March 2009 (115212)

» Determinants of Recovery Rates on Defaulted Bonds and Loans for North American Corporate Issuers, 1983-2003, December 2004 (90593)

To access any of these reports, click on the entry above. Note that these references are current as of the date of publication of this report and that more recent reports may be available. All research may not be available to all clients.

13. Acknowledgement

Moody's wishes to thank Project Finance International and its parent company Thomson Reuters for their assistance in making their database records available to create the Industry Data Set referenced herein. In particular, Moody's would like to thank Ewelina Jarecka, Thomson Reuters for her assistance in compiling and analyzing the Industry Data Set.

14. Notice re Data Consortium

The data presented in this Study is sourced from the Data Consortium which is managed by Moody's Analytics. All analytics and statistics are compiled by Moody's Analytics on behalf of Moody's; all market and industry commentary has been prepared by Moody's.

For questions about the Moody's Analytics Project Finance Data Consortium or the data in this report, please contact Kevin Kelhoffer, Director Data Strategy, Moody's Analytics (+1 212 553 7252; kevin.kelhoffer@moodys.com). For all other questions and inquiries please contact the author(s) cited in this report.

Moody's Analytics would be pleased to hear from other banks or financial institutions that may be interested in participating in the Data Consortium.

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