

# Moody's Infrastructure-relevant Data Sets

**Andrew Davison**, Senior Vice President

2 November, 2017

# Moody's Infrastructure-relevant Data Sets

- » Unique insight on the credit performance of two infrastructure-relevant data sets:
  - \$2.0 trillion of unrated project finance bank loans
  - \$2.8 trillion of Moody's-rated infrastructure debt securities
- » Recent default study research on unrated project finance bank loans
  - Jan 2017: Project type and jurisdiction matter
  - Mar 2017: Annual default study (1983-2015)
  - Oct 2017: Infrastructure sector hurt by demand risk
- » Recent default study research on Moody's-rated infrastructure debt
  - Apr 2017: Addendum to default study (1983-2015) focusing on corporate infrastructure
  - Jul 2017: Annual default study (1983-2016)

***Moody's analysis shows credit characteristics that are likely to be attractive to long-term investors***

# Moody's PF Bank Loan Data Set

Mar 2017: Annual default study (1983-2015)

MARCH 6, 2017		INFRASTRUCTURE
Moody's INVESTORS SERVICE		
SECTOR IN-DEPTH		
Table of Contents:		
1. UPDATE TO THIS YEAR'S STUDY	2	
2. SUMMARY OF KEY FINDINGS	3	
3. OVERVIEW OF THE PROJECT FINANCE INDUSTRY	5	
4. DATA AND METHODOLOGY	9	
5. DISTRIBUTION OF PROJECTS	13	
6. DISTRIBUTION OF DEFAULTS	16	
7. DEFAULT RATE ANALYSIS	17	
8. RECOVERY ANALYSIS	25	
9. FURTHER ANALYSIS OF TIME TO DEFAULT AND TIME TO EMERGENCE BY INDUSTRY	45	
10. EXPOSURE AT DEFAULT	46	
11. APPENDICES	48	
12. MOODY'S RELATED RESEARCH	73	
13. ACKNOWLEDGEMENT	74	
14. NOTICE RE DATA CONSORTIUM	74	
Analyst Contacts:		
LONDON	+44.20.7772.5454	
Andrew Davison Senior Vice President andrew.davison@moody.com	+44.20.7772.5552	
NEW YORK	+1.212.553.1653	
Kathrin Hattmann Assistant Vice President - Analyst kathrin.hattmann@moody.com		
Walter Winrow Managing Director - Global Project and Infrastructure Finance walter.winrow@moody.com	+1.212.553.7943	
AJ Sabatella Associate Managing Director - Project Finance aj.sabatella@moody.com	+1.212.553.4136	
Michael Mulvaney Managing Director - Project Finance michael.mulvaney@moody.com	+1.212.553.3665	

## 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.

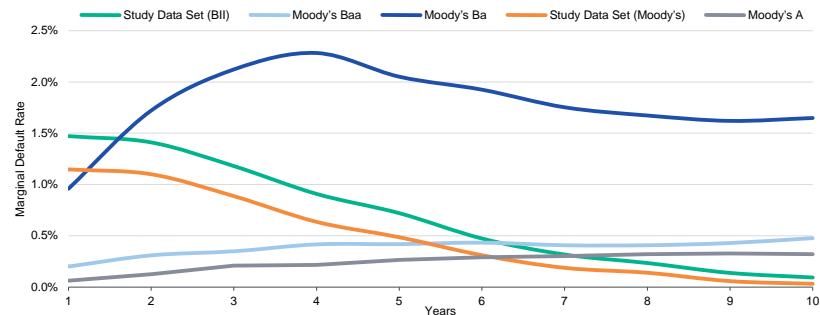
» Project jurisdiction matters in the initial years of a project. Jurisdiction tends to be a less critical driver of default rates once a project has started to build an operating track record. Average ultimate recovery rates show a degree of variation by World Bank Group Country Classification, but 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.

- » Latest annual default study published in March 2017:
  - Updated data set 9% larger
  - 6,389 projects representing 62% of all project finance transactions 1983-2015
  - New insight 2008-15 and from segmentation by World Bank Group country classification
- » Key findings include:
  - Marginal default rates trend towards levels consistent with single-A:



- Incremental risk during the construction phase and/or ramp-up
- Ultimate recovery rates are high, averaging 80%
- Adverse impact of demand risk in the Infrastructure sector
- Project jurisdiction matters
- PPP projects are a discrete sub-sector



# Moody's-rated Infrastructure Data Set

Jul 2017: Annual default study (1983-2016)

INFRASTRUCTURE AND PROJECT FINANCE

**Moody's**  
INVESTORS SERVICE

**DATA-REPORT**  
27 July 2017

[Rate this Research](#)

**TABLE OF CONTENTS**

Introduction 2

Characteristics of Moody's-Rated Infrastructure Universe 3

Ratings Performance of Moody's-Rated Infrastructure Universe 13

Appendices 35

Moody's Related Research 55

**Contacts**

Federico Beckmann 212-553-1953  
Analyst/RPO  
federico.beckmann@moody.com

Varun Agarwal 212-553-4899  
VP, Senior Analyst/  
MDG  
varun.agarwal@moody.com

Suzanne Wingo 212-553-0571  
Global Credit Officer  
suzanne.wingo@moody.com

Andrew Davison 44-20-7772-5552  
Senior Vice President  
andrew.davison@moody.com

Kumar Kanthan 212-553-1428  
Senior Vice President/  
MDG  
kumar.kanthan@moody.com

Walter J. Winrow 212-553-3633  
MD, CRI and Infr  
Fin  
walter.winrow@moody.com

**Default Research**

**Infrastructure Default and Recovery Rates, 1983-2016**

This study is an update to our previous publication, "Infrastructure Default and Recovery Rates, 1983-2015," published in July 2016, and focuses on the credit and ratings performance of Moody's-rated infrastructure securities from 1983-2016.<sup>1</sup> We first characterize the infrastructure universe on the basis of its regional and sectoral distributions, overall default and credit loss rates, ratings distribution, and ratings stability. We then compare the ratings performance of the infrastructure universe vis-à-vis non-financial corporate (NFC) issuers by examining migration rates, default and credit loss rates by rating as well as rating accuracy metrics.<sup>2,3</sup> Appendix 4 examines the performance of the infrastructure universe over the past ten years, i.e., 2007-2016. Our main findings are:

- In the aggregate, infrastructure debts are less likely to incur credit losses than 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 6.2% and 9.1%, respectively, for a typical NFC issuer.<sup>4,5,6</sup>
- Moody's infrastructure ratings are predominantly investment-grade.<sup>7</sup> As of year-end 2016, 92% of total infrastructure ratings held an investment-grade rating compared to 40% for NFC issuer ratings.<sup>8</sup>
- Infrastructure ratings are more stable than NFC ratings, driven in large part by the stability of the US municipal infrastructure sector. On average, ratings on total infrastructure securities have been 40% as volatile as NFC ratings. The corresponding figures for US municipal infrastructure securities and corporate infrastructure and project finance securities are 19% and 84%, respectively.<sup>9</sup>
- Credit loss rates for A-rated and Baa-rated corporate infrastructure and project finance debt securities and NFC issuers are similar up through a five-year horizon.<sup>10</sup> Default rates for both A-rated 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 incur lower losses given default.<sup>11</sup>
- 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 91.2% (86.4%) versus 89.4% (86.5%) for NFC issuers.<sup>12,13,14</sup>

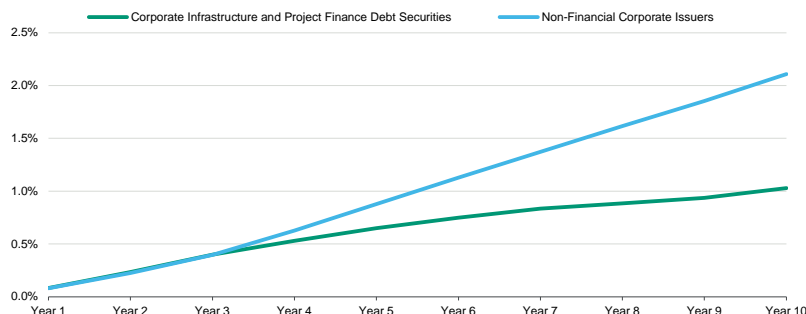
» Latest annual default study published in Jul 2017:

- We report on the credit and ratings performance of Moody's-rated infrastructure debts from 1983-2016

» Key findings include:

- Infrastructure ratings are more stable than those of non-financial corporates
- Credit loss rates for A-rated and Baa-rated infrastructure debts are lower over the medium/long term compared with like-rated non-financial corporates

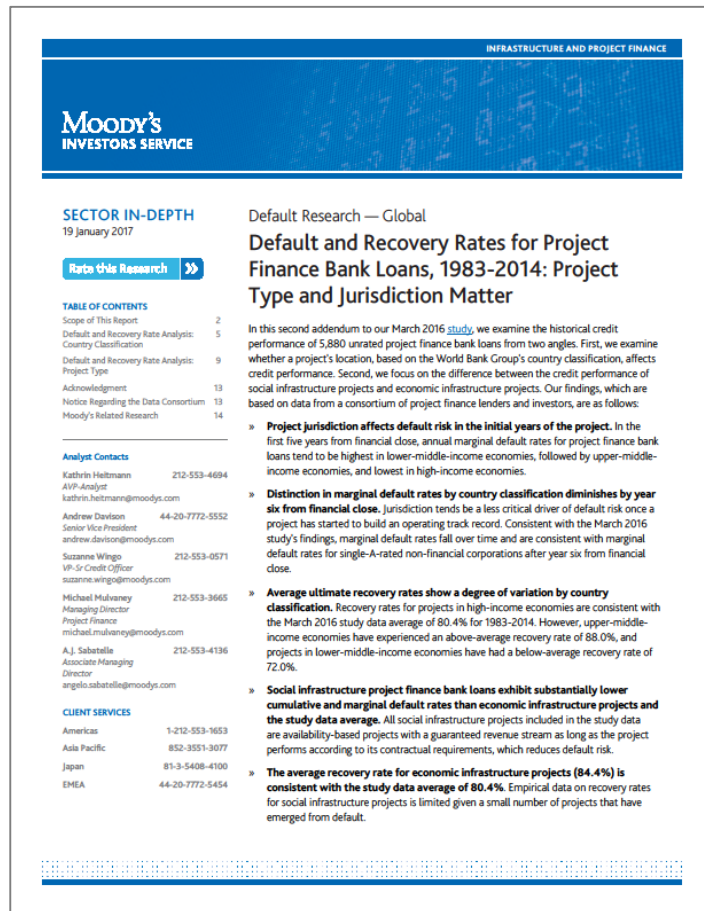
## Baa Credit Loss Rates:



# Appendix

# Moody's PF Bank Loan Data set

Jan 2017: Project type and jurisdiction matter



- » Incremental research published in Jan 2017 examining:
  - Whether a project's location affects credit performance
  - Differences between the credit performance of social infrastructure and economic infrastructure
- » Key findings include:
  - Project jurisdiction affects default risk in the initial years of the project
  - Distinction in marginal default rates by country classification diminishes as loans season
  - Average ultimate recovery rates show a degree of variation by country classification
  - Social infrastructure projects exhibit substantially lower default rates than economic infrastructure projects
  - The average recovery rate for economic infrastructure projects is consistent with the study average

# Moody's PF Bank Loan Data set

## Oct 2017: Infrastructure sector hurt by demand risk

INFRASTRUCTURE AND PROJECT FINANCE

**Moody's**  
INVESTORS SERVICE

**SECTOR IN-DEPTH**  
9 October 2017

[Rate this Research](#) »

**TABLE OF CONTENTS**

Scope of this addendum	2
Credit stress continued in the Western European transportation sector in 2015	5
Distribution of projects and defaults	6
Default rate analysis	7
Recovery rate analysis	18
Appendix: Glossary	21
Moody's Related Research	23
Notice vs Data Consortium	24

**Contacts**

Kathryn Hattmann VP, Senior Analyst kathryn.hattmann@moody's.com	212-553-4694
Andrew Davison Senior Vice President andrew.davison@moody's.com	44-20-7772-5552
Michael Mulvaney MD, Project Finance michael.mulvaney@moody's.com	212-553-3665
Walter J. Witrow MD, C&I Proj and Infra Fin walter.witrow@moody's.com	212-553-7943

**CLIENT SERVICES**

Americas	1-212-553-1653
Asia Pacific	852-3551-3077
Japan	81-3-5408-4100
EMEA	44-20-7772-5454

Default Research - Global

**Default and recovery rates for project finance bank loans, 1983-2015: Infrastructure sector hurt by demand risk**

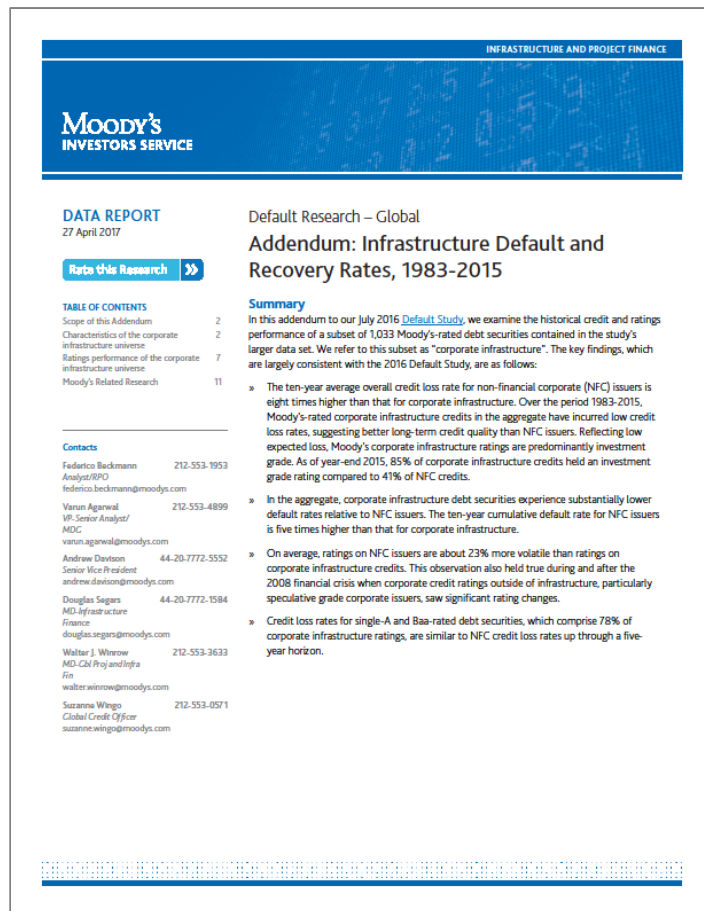
This addendum to our [March 2017 study](#) examines the credit performance of a subset of 2,060 infrastructure-related projects in the study's larger data set of unrated project finance bank loans. We refer to this subset as Broad Infrastructure Project Finance. We further segment this subset to highlight the contrasting performance of projects with availability-based revenues against those exposed to volume (i.e. demand) or price risks. Our findings are as follows:

- » **Credit stress continued in the Western European transportation sector in 2015.** The default tally was nine in 2015 for the Broad Infrastructure Project Finance subset and defaults were mostly Western European public-private partnership (PPP) transportation projects. The 10-year cumulative default rate increased to 5.8% from 4.9% reported in last year's [addendum](#), but remains below the total study data average of 6.7% and is consistent with corporate issuers of low investment-grade quality.
- » **Marginal default rates fall over time.** Consistent with the findings of the March 2017 study, marginal default rates, a measure of the likelihood that a performing obligor at the start of a year will default in that year, decline as a project completes construction and builds an operating track record. Marginal default rates for Broad Infrastructure Project Finance and PPPs are consistent with marginal default rates for Baa3-rated corporates from year five after financial close.
- » **Availability-based PPP projects and availability-based projects lie at the low end of the risk spectrum.** The 10-year cumulative default rate of 2.1%, is below those of the Broad Infrastructure Finance subset and the total study data average. Marginal default rates are consistent with single-A rated corporates by year five from financial close.
- » **Non-availability based PPP projects and non-availability based projects exhibit high default risk during the initial project life.** These projects are exposed to volume or price risks. Ten-year cumulative default rates of non-availability-based PPP projects (13.7%) and non-availability-based projects (10.9%) are more in line with Ba-rated corporates. Marginal default rates are consistent with low investment-grade rated corporates by year eight from financial close.
- » **Average ultimate recovery rates are consistent with the 79.5% average for the entire study data set for 1983-2015.** Excluding a single outlier with a 100% write-off, average ultimate recovery rates for all subsets exceed the average of the study data set. However, the majority of defaulted projects have yet to emerge from default.

- » Incremental research published in Oct 2017 examining a subset of infrastructure-related projects
  - We also contrast the performance of projects with availability-based revenues versus those exposed to revenue risk
- » Key findings include:
  - Credit stress continued in the Western European transportation sector in 2015
  - Marginal default rates fall over time
  - Availability-based PPP projects and availability-based projects lie at the low end of the risk spectrum
  - Non-availability based PPP projects and non-availability based projects exhibit high default risk during the initial project life
  - Average ultimate recovery rates are consistent with the study average

# Moody's-rated Infrastructure Data Set

Apr 2017: Addendum to default study (1983-2015) focusing on corporate infrastructure



- » Incremental research published in April 2017 examining a subset of Moody's-rated corporate infrastructure debts
- » Key findings include:
  - The ten-year average overall credit loss rate for non-financial corporate (NFC) issuers is eight times higher than that for corporate infrastructure
  - In aggregate, corporate infrastructure debt securities experience substantially lower default rates relative to NFC issuers
  - On average, ratings on NFC issuers are about 23% more volatile than ratings on corporate infrastructure credits
  - Credit loss rates for single-A and Baa-rated debt securities, which comprise 78% of corporate infrastructure ratings, are similar to NFC credit loss rates up through a five year horizon





# Moody's

INVESTORS SERVICE

Andrew Davison  
Email: [andrew.davison@moodys.com](mailto:andrew.davison@moodys.com)  
Phone: +44 20 7772 5552

[moodys.com](http://moodys.com)

This publication does not announce a credit rating action. For any credit ratings referenced in this publication, please see the ratings tab on the issuer/entity page on [www.moodys.com](http://www.moodys.com) for the most updated credit rating action information and rating history.

© 2017 Moody's Corporation, Moody's Investors Service, Inc., Moody's Analytics, Inc. and/or their licensors and affiliates (collectively, "MOODY'S"). All rights reserved.

CREDIT RATINGS ISSUED BY MOODY'S INVESTORS SERVICE, INC. AND ITS RATINGS AFFILIATES ("MIS") ARE MOODY'S CURRENT OPINIONS OF THE RELATIVE FUTURE CREDIT RISK OF ENTITIES, CREDIT COMMITMENTS, OR DEBT OR DEBT-LIKE SECURITIES, AND MOODY'S PUBLICATIONS MAY INCLUDE MOODY'S CURRENT OPINIONS OF THE RELATIVE FUTURE CREDIT RISK OF ENTITIES, CREDIT COMMITMENTS, OR DEBT OR DEBT-LIKE SECURITIES. MOODY'S DEFINES CREDIT RISK AS THE RISK THAT AN ENTITY MAY NOT MEET ITS CONTRACTUAL, FINANCIAL OBLIGATIONS AS THEY COME DUE AND ANY ESTIMATED FINANCIAL LOSS IN THE EVENT OF DEFAULT. CREDIT RATINGS DO NOT ADDRESS ANY OTHER RISK, INCLUDING BUT NOT LIMITED TO: LIQUIDITY RISK, MARKET VALUE RISK, OR PRICE VOLATILITY. CREDIT RATINGS AND MOODY'S OPINIONS INCLUDED IN MOODY'S PUBLICATIONS ARE NOT STATEMENTS OF CURRENT OR HISTORICAL FACT. MOODY'S PUBLICATIONS MAY ALSO INCLUDE QUANTITATIVE MODEL-BASED ESTIMATES OF CREDIT RISK AND RELATED OPINIONS OR COMMENTARY PUBLISHED BY MOODY'S ANALYTICS, INC. CREDIT RATINGS AND MOODY'S PUBLICATIONS DO NOT CONSTITUTE OR PROVIDE INVESTMENT OR FINANCIAL ADVICE, AND CREDIT RATINGS AND MOODY'S PUBLICATIONS ARE NOT AND DO NOT PROVIDE RECOMMENDATIONS TO PURCHASE, SELL, OR HOLD PARTICULAR SECURITIES. NEITHER CREDIT RATINGS NOR MOODY'S PUBLICATIONS COMMENT ON THE SUITABILITY OF AN INVESTMENT FOR ANY PARTICULAR INVESTOR. MOODY'S ISSUES ITS CREDIT RATINGS AND PUBLISHES MOODY'S PUBLICATIONS WITH THE EXPECTATION AND UNDERSTANDING THAT EACH INVESTOR WILL, WITH DUE CARE, MAKE ITS OWN STUDY AND EVALUATION OF EACH SECURITY THAT IS UNDER CONSIDERATION FOR PURCHASE, HOLDING, OR SALE.

MOODY'S CREDIT RATINGS AND MOODY'S PUBLICATIONS ARE NOT INTENDED FOR USE BY RETAIL INVESTORS AND IT WOULD BE RECKLESS AND INAPPROPRIATE FOR RETAIL INVESTORS TO USE MOODY'S CREDIT RATINGS OR MOODY'S PUBLICATIONS WHEN MAKING AN INVESTMENT DECISION. IF IN DOUBT YOU SHOULD CONTACT YOUR FINANCIAL OR OTHER PROFESSIONAL ADVISER.

ALL INFORMATION CONTAINED HEREIN IS PROTECTED BY LAW, INCLUDING BUT NOT LIMITED TO, COPYRIGHT LAW, AND NONE OF SUCH INFORMATION MAY BE COPIED OR OTHERWISE REPRODUCED, REPACKAGED, FURTHER TRANSMITTED, TRANSFERRED, DISSEMINATED, REDISTRIBUTED OR RESOLD, OR STORED FOR SUBSEQUENT USE FOR ANY SUCH PURPOSE, IN WHOLE OR IN PART, IN ANY FORM OR MANNER OR BY ANY MEANS WHATSOEVER, BY ANY PERSON WITHOUT MOODY'S PRIOR WRITTEN CONSENT.

All information contained herein is obtained by MOODY'S from sources believed by it to be accurate and reliable. Because of the possibility of human or mechanical error as well as other factors, however, all information contained herein is provided "AS IS" without warranty of any kind. MOODY'S adopts all necessary measures so that the information it uses in assigning a credit rating is of sufficient quality and from sources MOODY'S considers to be reliable including, when appropriate, independent third-party sources. However, MOODY'S is not an auditor and cannot in every instance independently verify or validate information received in the rating process or in preparing the Moody's publications.

To the extent permitted by law, MOODY'S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability to any person or entity for any indirect, special, consequential, or incidental losses or damages whatsoever arising from or in connection with the information contained herein or the use of or inability to use any such information, even if MOODY'S or any of its directors, officers, employees, agents, representatives, licensors or suppliers is advised in advance of the possibility of such losses or damages, including but not limited to: (a) any loss of present or prospective profits or (b) any loss or damage arising where the relevant financial instrument is not the subject of a particular credit rating assigned by MOODY'S.

To the extent permitted by law, MOODY'S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability for any direct or compensatory losses or damages caused to any person or entity, including but not limited to by any negligence (but excluding fraud, willful misconduct or any other type of liability that, for the avoidance of doubt, by law cannot be excluded) on the part of, or any contingency within or beyond the control of, MOODY'S or any of its directors, officers, employees, agents, representatives, licensors or suppliers, arising from or in connection with the information contained herein or the use of or inability to use any such information.

NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE ACCURACY, TIMELINESS, COMPLETENESS, MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OF ANY SUCH RATING OR OTHER OPINION OR INFORMATION IS GIVEN OR MADE BY MOODY'S IN ANY FORM OR MANNER WHATSOEVER.

Moody's Investors Service, Inc., a wholly-owned credit rating agency subsidiary of Moody's Corporation ("MCO"), hereby discloses that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by Moody's Investors Service, Inc. have, prior to assignment of any rating, agreed to pay to Moody's Investors Service, Inc. for appraisal and rating services rendered by it fees ranging from \$1,500 to approximately \$2,500,000. MCO and MIS also maintain policies and procedures to address the independence of MIS's ratings and rating processes. Information regarding certain affiliations that may exist between directors of MCO and rated entities, and between entities who hold ratings from MIS and have also publicly reported to the SEC an ownership interest in MCO of more than 5%, is posted annually at [www.moodys.com](http://www.moodys.com) under the heading "Investor Relations — Corporate Governance — Director and Shareholder Affiliation Policy."

Additional terms for Australia only: Any publication into Australia of this document is pursuant to the Australian Financial Services License of MOODY'S affiliate, Moody's Investors Service Pty Limited ABN 61 003 399 657AFSL 336969 and/or Moody's Analytics Australia Pty Ltd ABN 94 105 136 972 AFSL 383569 (as applicable). This document is intended to be provided only to "wholesale clients" within the meaning of section 761G of the Corporations Act 2001. By continuing to access this document from within Australia, you represent to MOODY'S that you are, or are accessing the document as a representative of, a "wholesale client" and that neither you nor the entity you represent will directly or indirectly disseminate this document or its contents to "retail clients" within the meaning of section 761G of the Corporations Act 2001. MOODY'S credit rating is an opinion as to the creditworthiness of a debt obligation of the issuer, not on the equity securities of the issuer or any form of security that is available to retail investors. It would be reckless and inappropriate for retail investors to use MOODY'S credit ratings or publications when making an investment decision. If in doubt you should contact your financial or other professional adviser.

Additional terms for Japan only: Moody's Japan K.K. ("MJKK") is a wholly-owned credit rating agency subsidiary of Moody's Group Japan G.K., which is wholly-owned by Moody's Overseas Holdings Inc., a wholly-owned subsidiary of MCO. Moody's SF Japan K.K. ("MSFJ") is a wholly-owned credit rating agency subsidiary of MJKK. MSFJ is not a Nationally Recognized Statistical Rating Organization ("NRSRO"). Therefore, credit ratings assigned by MSFJ are Non-NRSRO Credit Ratings. Non-NRSRO Credit Ratings are assigned by an entity that is not a NRSRO and, consequently, the rated obligation will not qualify for certain types of treatment under U.S. laws. MJKK and MSFJ are credit rating agencies registered with the Japan Financial Services Agency and their registration numbers are FSA Commissioner (Ratings) No. 2 and 3 respectively.

MJKK or MSFJ (as applicable) hereby disclose that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by MJKK or MSFJ (as applicable) have, prior to assignment of any rating, agreed to pay to MJKK or MSFJ (as applicable) for appraisal and rating services rendered by it fees ranging from JPY200,000 to approximately JPY350,000,000.

MJKK and MSFJ also maintain policies and procedures to address Japanese regulatory requirements.