

# Navigating a Credit Portfolio Beyond COVID-19

Amnon Levy, Head of Portfolio and Balance Sheet Research  
Tim Daly, Head of Strategic Relationship Management

July 2020

# Today's Speakers



**Amnon Levy**

*Head of Portfolio Management*



**Tim Daly**

*Head of Strategic  
Relationship Management*

# Global Challenge

How does one navigate a credit portfolio through so much uncertainty?

- » Where will we see infection rates accelerate and economic activity deteriorate?
- » How long will it take for a vaccine to stabilize economic activity?
- » What are the cross-sectional implications for default and impairment?
- » Are government programs, deferment and forbearance masking the inevitable?
- » Over the longer term, what will the psychological impact be on behavior?
- » What is the new normal?



# Challenge: How Do You Manage Risk into the Next Normal?

Uncertainty likely to persist



## DRIVERS

- » Epidemiological – progression of the epidemic
- » Sociological - response of people, businesses, governments and medical community



## ECONOMIC IMPACT

- » Depends on extent, timing, and interaction of drivers
- » Is uncertain, unpredictable, and changing fast
- » Varies across industries + regions



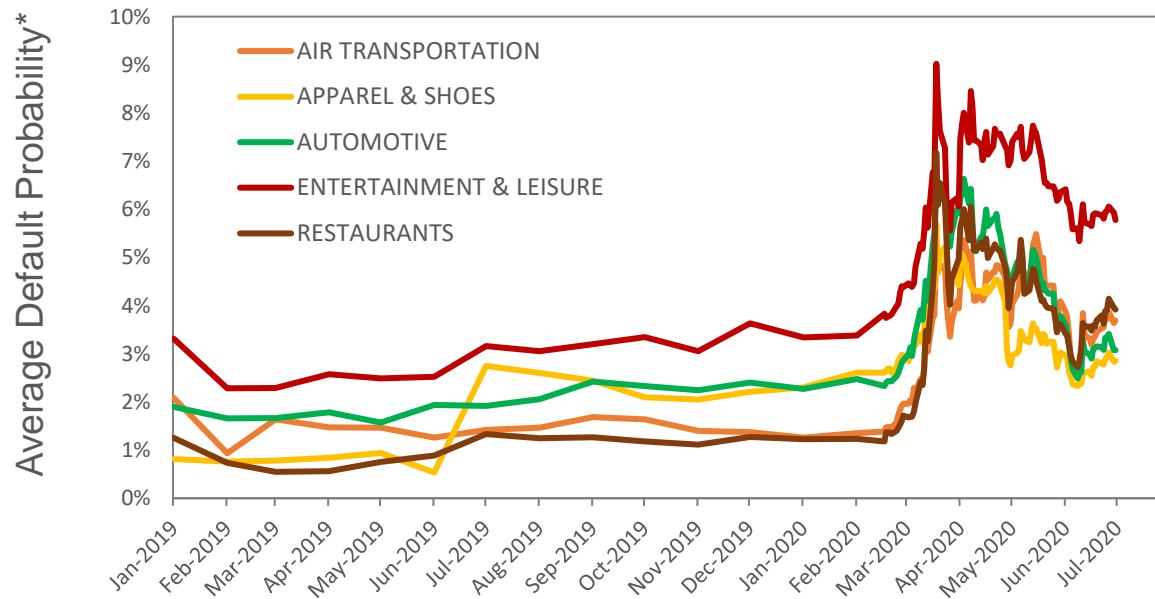
## MEASURING & MANAGING RISK

- » Measurement requires timely assessment of current environment
- » Management requires timely assessment of environment under multiple epidemiological and sociological scenarios

# Empirical Patterns

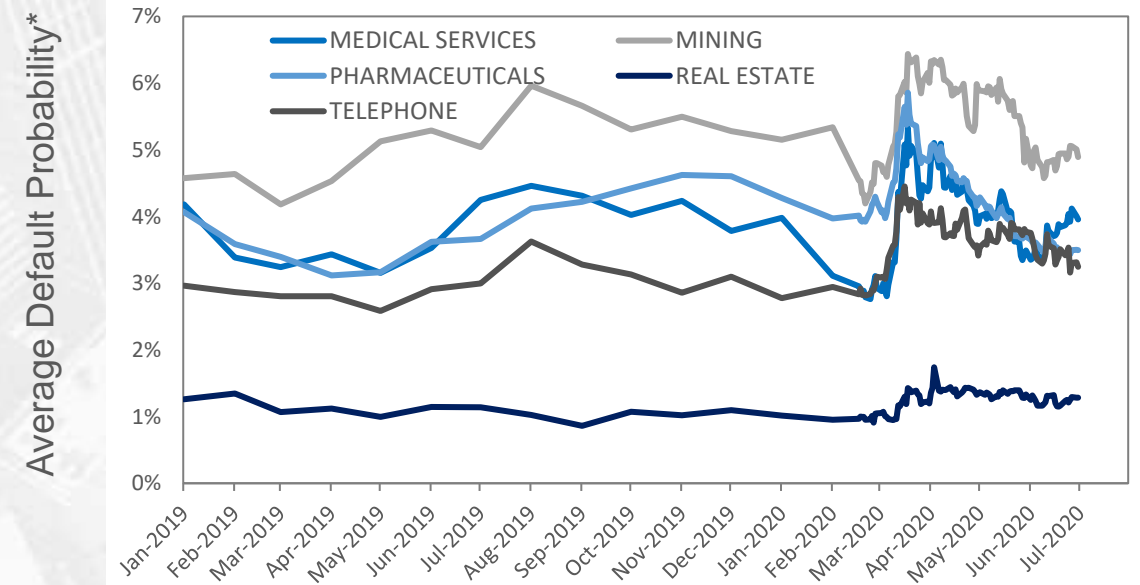
How has COVID-19 impacted industries so far?

## Industries Most Impacted by COVID-19



\*Measured using Moody's EDF based on US Sample with EDF < 10% as of 12/31/2019

## Industries with Mild Impact to COVID-19



\*Measured using Moody's EDF based on US Sample with EDF < 10% as of 12/31/2019

# Understanding the Challenges

## Credit measures don't lend themselves to COVID 19



### Traditional Internal Ratings

- » Rely on fundamental name-level analysis
- » Cannot be updated as frequent as virus evolution



### Loss Forecasting & Accounting Models

- » Leverage broad-brush scenarios that can not capture COVID-19's cross-sectional impact
- » Macro-economic variables and their projections are "out of range"
- » Unable to balance possibility of longer term degradation without over-penalizing viable industries and business models



### Fiscal & Monetary Impact

- » Unable to capture government and fiscal policy impact across segments



### Who needs help?

- » Credit Analysts
- » Investment Managers
- » Risk Managers
- » Regulators
- » Credit Strategies Desk

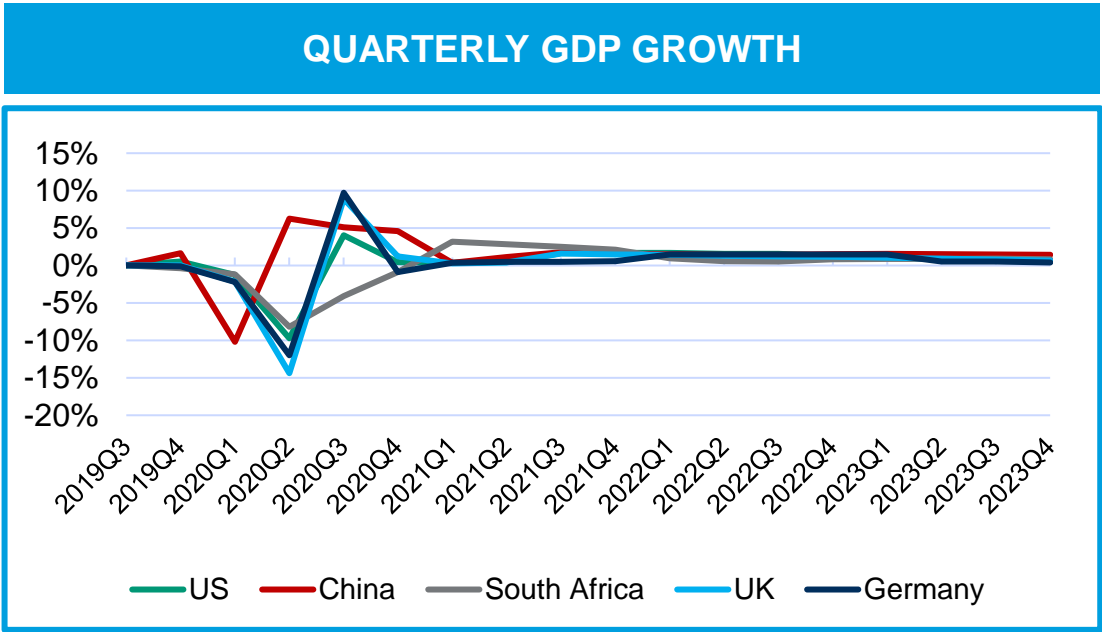
# Timely and Dynamic Data and Analytics

## Requirements for navigating public and private corporates credit

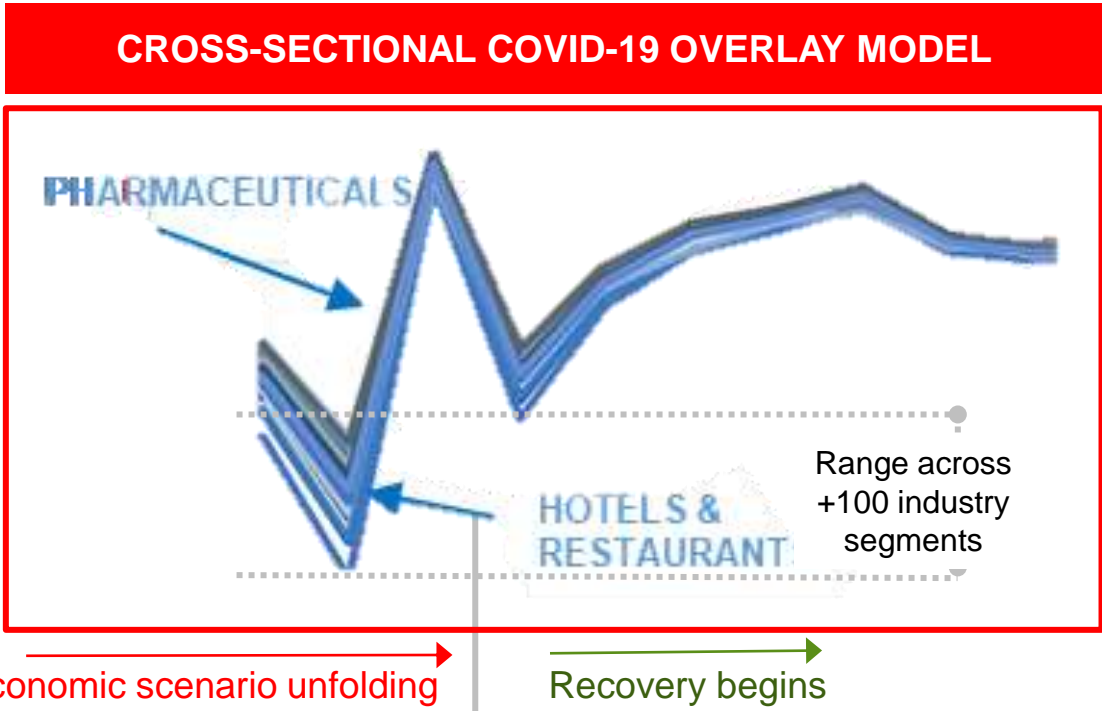
- ① Granular, quantitative and repeatable current credit assessment
- ② Assessment of trajectories that consider:
  - Epidemiological paths – severity, length of economic shutdown accounting for government reaction (e.g., draconian social distancing)
  - Medical progress (e.g., development of a vaccine)
  - Cross-Sectional sensitivity to COVID-19
  - Targeted fiscal/monetary policies
- ③ With applications toward:
  - An overlay or benchmark to internal rating
  - An overlay or benchmark to stress testing/CECL/IFRS 9 models
  - Early warning indicator
  - A complement to other credit portfolio and capital planning processes

# Economic Impact Defined by Broad Brush Scenarios

Require Industry Overlay Model



Source: Moody's Analytics July Economic Scenarios – S3



There are a Wide Range of Economic Forecasts

Sources: Atlanta Fed,  
The Wall Street Journal

THE WALL STREET JOURNAL

Why the Economic Recovery Will Be More of a 'Swoosh' Than V-Shaped

...a large drop followed by a painfully slow recovery, similar in shape to the Nike logo



FEDERAL RESERVE BANK of ATLANTA

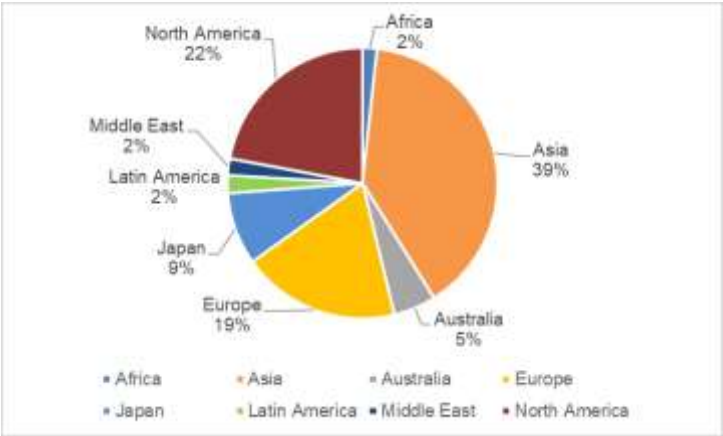
2020 Q2, quarterly GDP growth, annualized rate:

- GDPNow model “-41.9%”
- Blue Chip Forecasts Range “-23%” to “-40%”

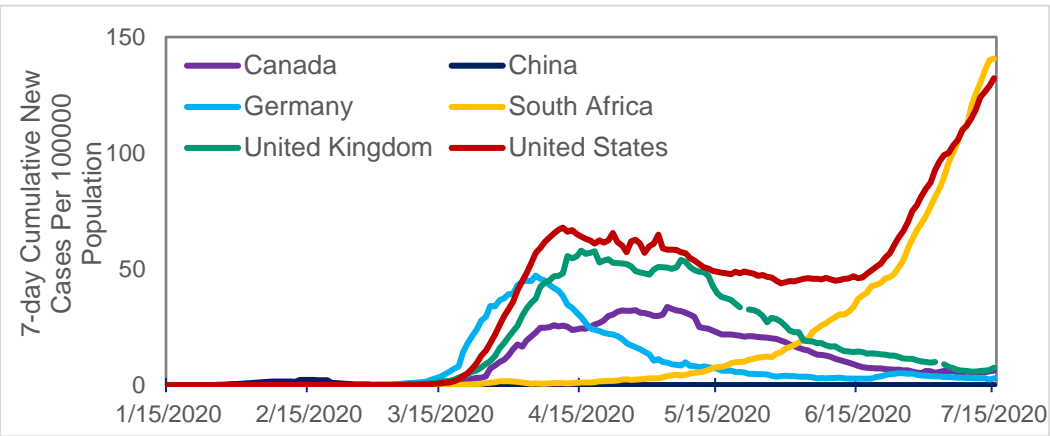
# Incorporating Epidemiological Dynamics

Similarities across segments after controlling for variation in epidemiology

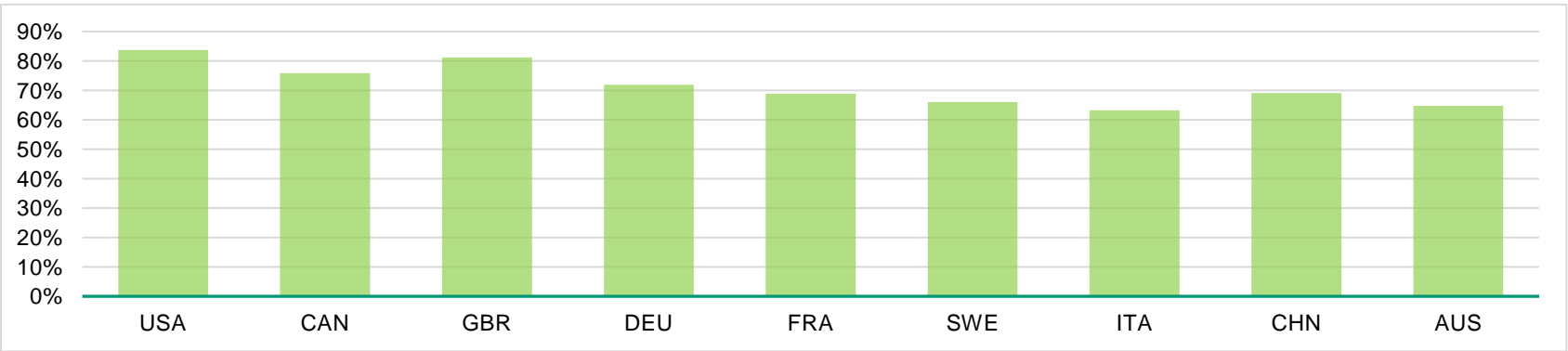
EDF CREDIT MEASURE  
(Global Sample of ~ 46,000 Firms)



WINDOWS FOR DIFFERENT COUNTRIES  
BASED ON DAILY COVID-19 CASES

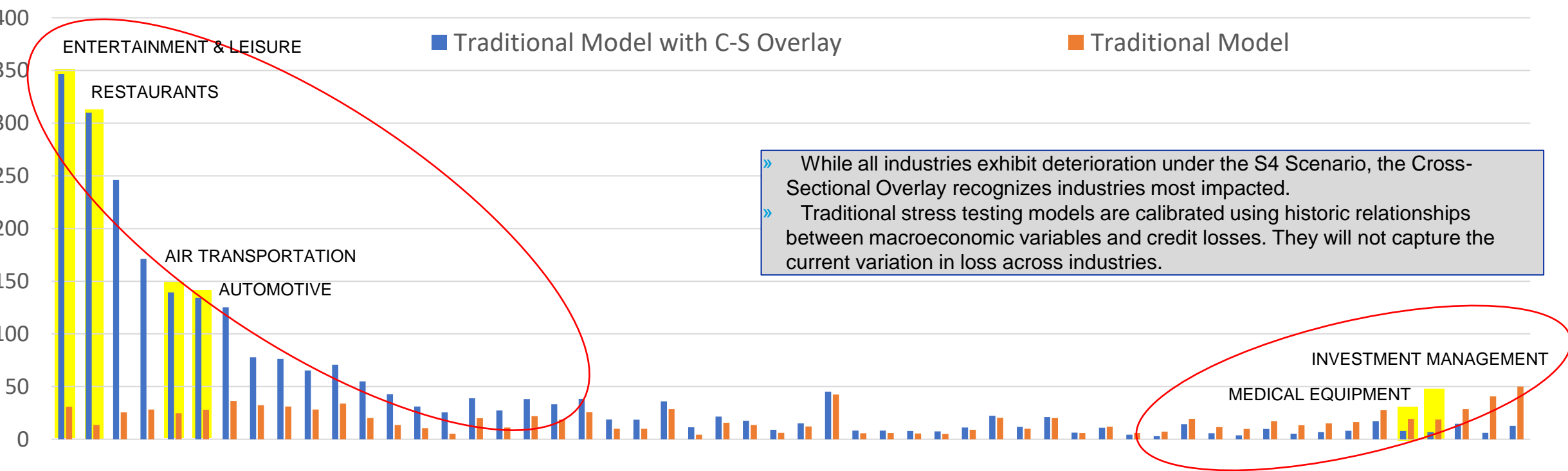


CORRELATION BETWEEN SEGMENT RANK WITHIN COUNTRY AND GLOBAL RANK



# Cross-Sectional COVID-19 Overlay Impact

Ratio of 1-year projected default probabilities to EDF as of Dec 31<sup>st</sup> 2019  
Realized (through June) and Moody's S4 96% Downside Scenario (through Dec)

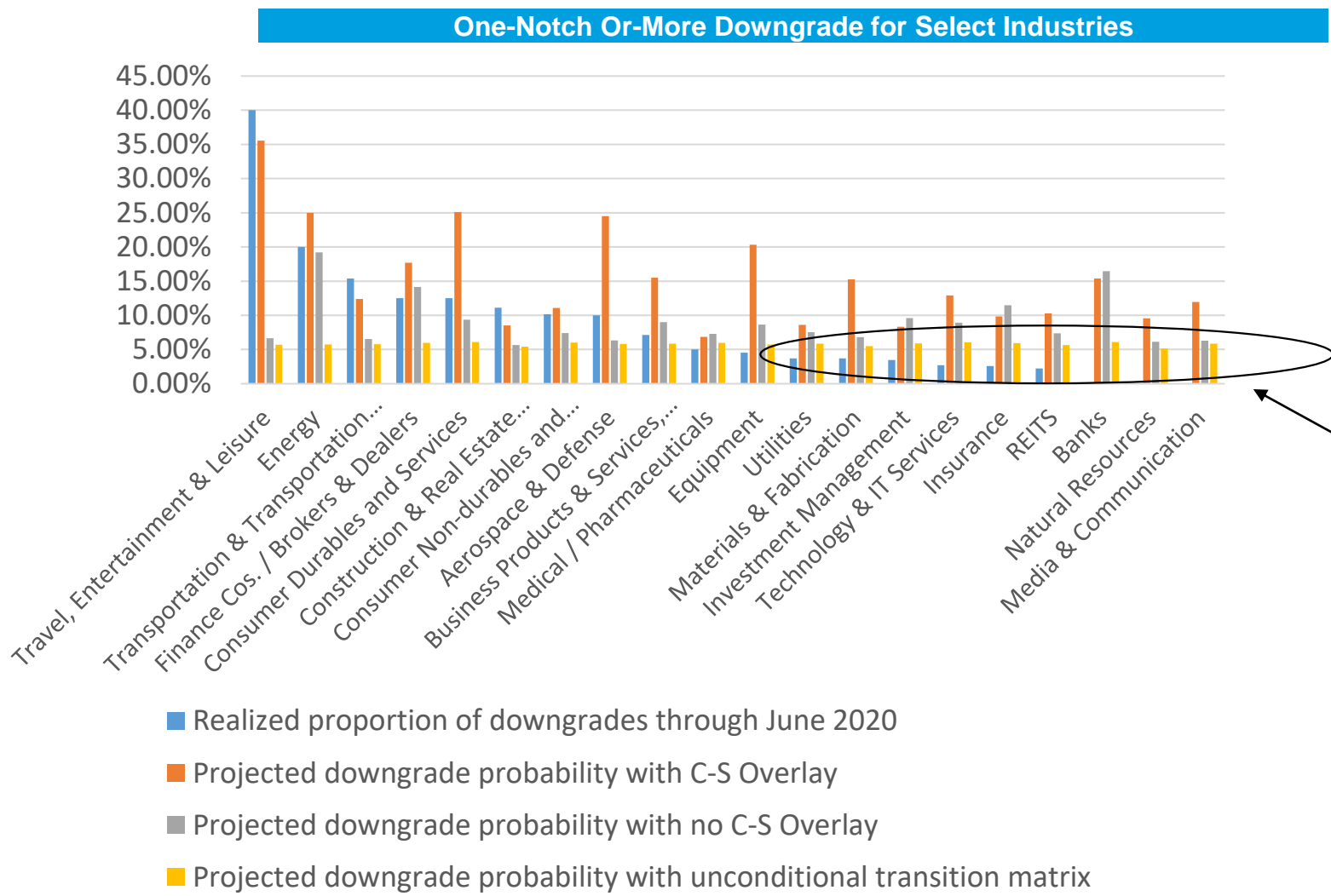


**U.S. 96th% Downside (S4):** assumes the crisis to last significantly longer with more cases and deaths than anticipated. Business closures wind down much more slowly than in the Baseline. There is a modest rebound in 2020 Q3 but a second wave of recession begins in 2020 Q4 until 2021 Q3. Real GDP is projected to fall -8% in 2020 and -5% in 2021 (compared to -5.8% and 1.6%, respectively, in the Baseline). Unemployment rate reaches a peak of 13.2% in early 2022. Disagreement in Congress prevent additional fiscal stimulus.

Moody's US IG rated sample.

# Performance - December 2019 to June 2020

## Credit Migration and Cross-Sectional COVID-19 Overlay



Accuracy Ratio			
Method	Number of downgrade notch		
		IG Firms	HY Firms
Cross-Sectional COVID -19 Overlay	1	0.409	0.384
	2	0.343	0.562
Unconditional Transition Matrix	1	-0.062	0.231
	2	-0.033	0.003

Model is probabilistic. Comparing actual vs modeled/projected will be challenging for industries with small samples.

**NOTES**

US Moody's rated firms as of Dec 31, 2019

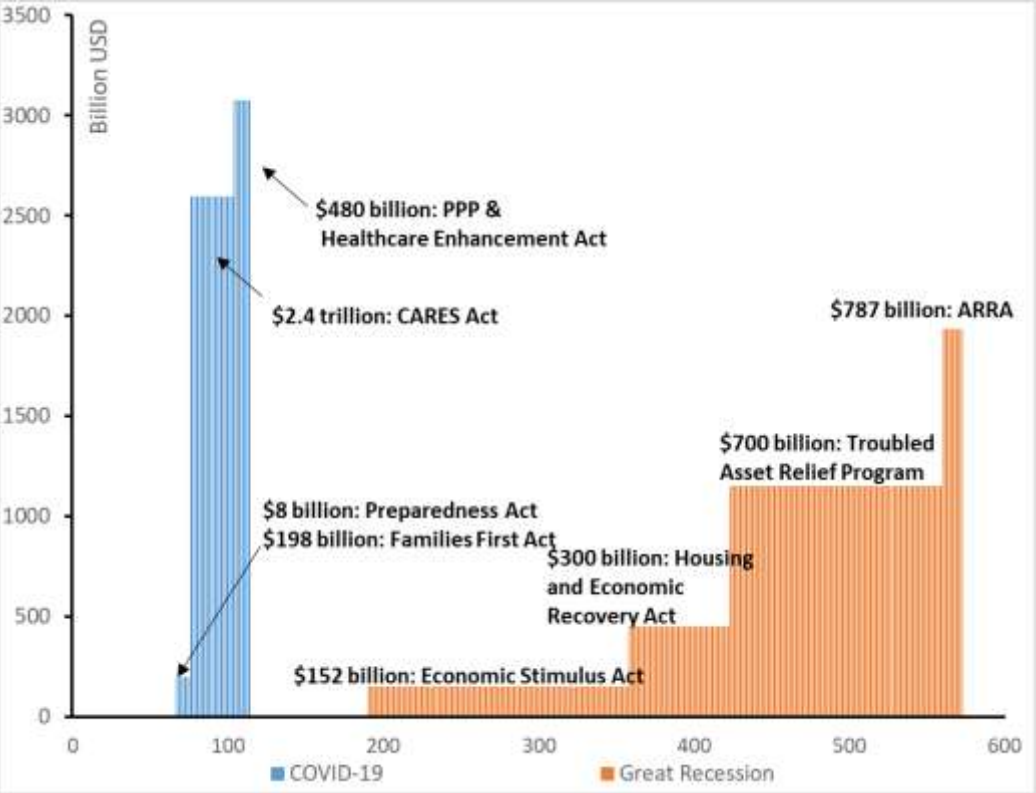
EDF data as of Dec 31 2019

Probability of downgrade from Dec 2019 to June 2020 are projected based on the realized macroeconomic statistics

# Remarkable Fiscal and Monetary Response

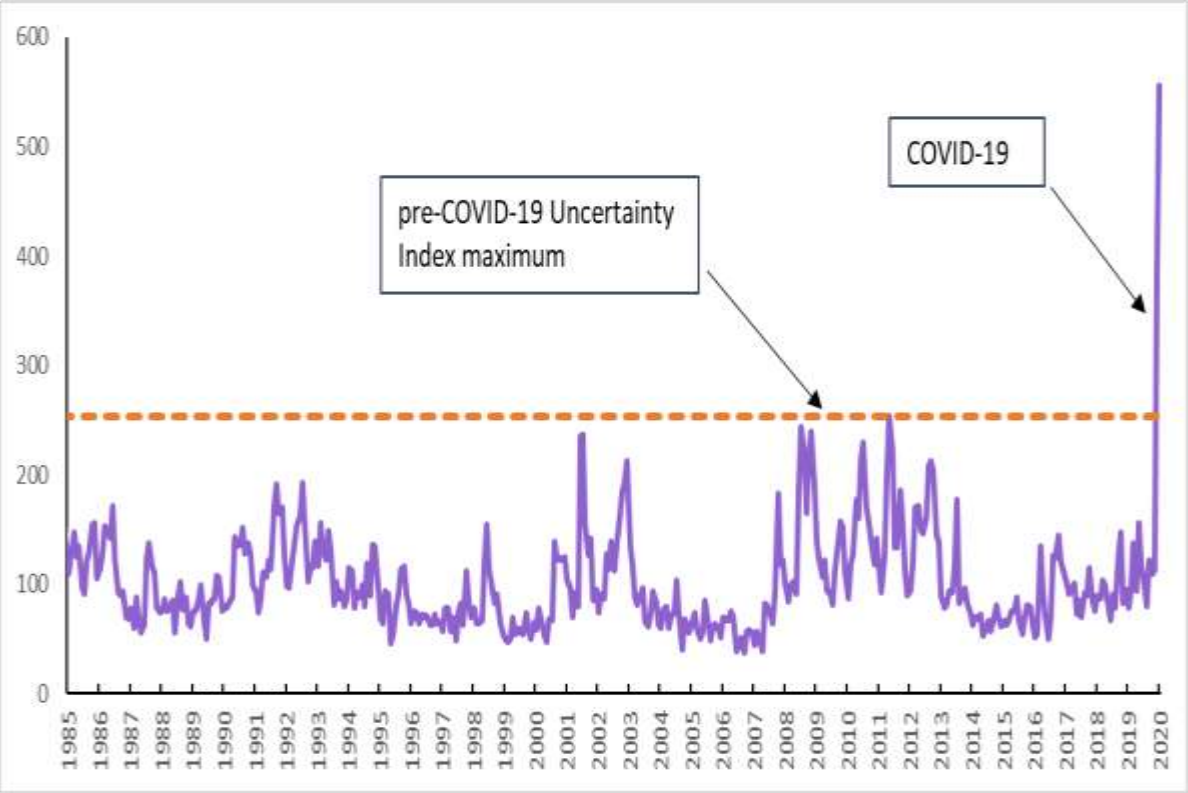
US economic policy uncertainty hitting record highs

COVID-19 FISCAL ACTION COMPARED TO THE GREAT RECESSION



Source: Moody's Analytics

ECONOMIC POLICY UNCERTAINTY INDEX



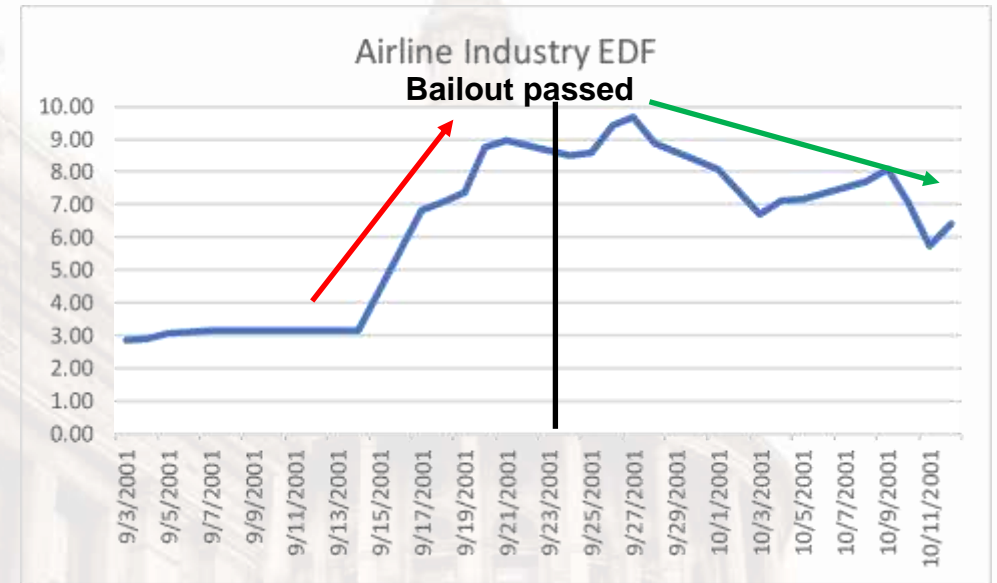
As reported by FRED Economic Data (<https://fred.stlouisfed.org/series/USEPUINDXD>).

# Quantifying US Program Impact

Historically, fiscal and monetary programs range in timing and the mechanisms that support targeted segments.

- 2001 Airline bailouts took several weeks to be understood with \$15B bailout on September 22<sup>nd</sup>.
- CBO estimated as much as 50% of the 2009 ARRA was deployed after 2010.
- In 2008/2009 there were multiple rounds of funding authorized by congress.

We face a range of fiscal and monetary scenarios with varying uncertain timelines and varying levels of effectiveness.



**NOTE** Impact of fiscal policy can be quantified – significant increase in EDF after 9/11, mitigated after Congress approved bailout package

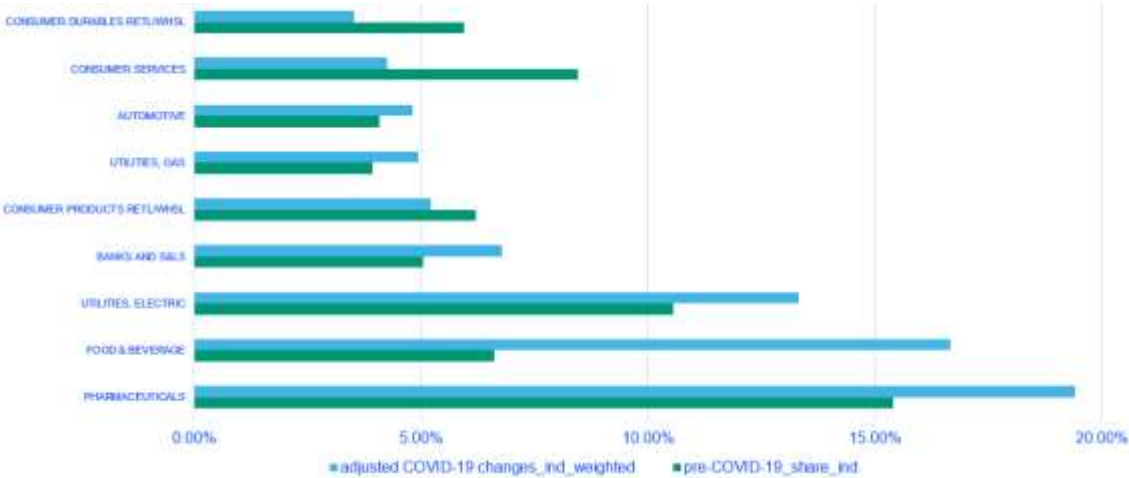


# Quantifying Targeted Stimulus Across US Segments

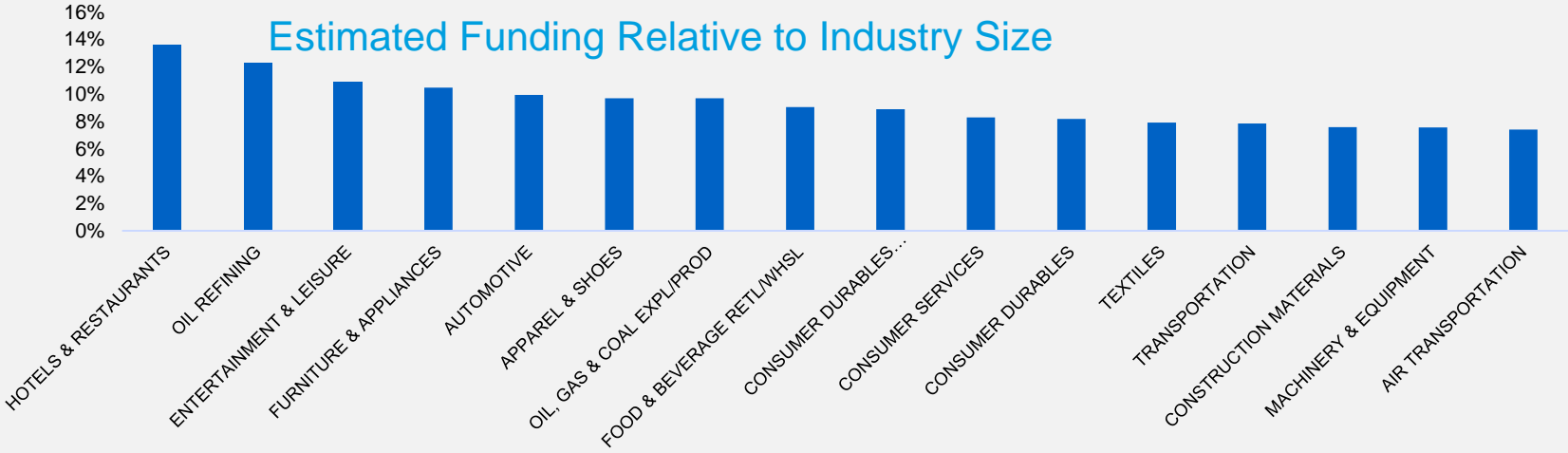
Aid Directly Targeting Corporate Segments  
Industries Most Severely Impacted by COVID-19

CONSUMER PRODUCTS RETL/WHSL	AUTOMOTIVE	Hotels	OIL REFINING	FOOD & BEVERAGE RETL/WHSL
OIL, GAS & COAL EXPL/PROD	CONSUMER DURABLES RETL/WHSL	CONSUMER PRODUCTS	BUSINESS PRODUCTS WHSL	CONSTRUCTION
RESTAURANTS	MACHINERY & EQUIPMENT	TRANSPORTATION	CONSUMER SERVICES	BROADCAST MEDIA
FOOD & BEVERAGE	ENTERTAINMENT & LEISURE	APPAREL & SHOES	PAPER	FURNITURE & APPLIANCES
ELECTRICAL EQUIPMENT	CONSTRUCTION MATERIALS	CONSUMER DURABLES	TRANSPORTATION EQUIPMENT	TEXTILES

Aid to Individuals – Consumer Behavior Changes



Estimated Funding Relative to Industry Size



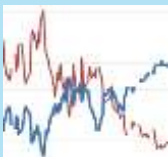
Hotels & Restaurants, Oil refining, and Entertainment & Leisure, are modeled to be most impacted the most by the stimulus plan.

# Pandemic Credit Data and Analytics

## ASSESSING WHAT HAS HAPPENED SO FAR



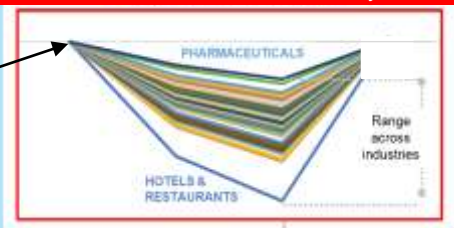
Elevated :  
- default probabilities  
- expected loss



Varying performance of  
segments, industries &  
names

MOST RECENT,  
REASONABLE, AND  
WELL-UNDERSTOOD  
CREDIT ASSESSMENT  
OF PORTFOLIO

Cross-Sectional COVID-19 Overlay Model



## CURRENT ASSESSMENT OF CREDIT TO PUBLIC AND PRIVATE CORPORATES

Current-State Internal Rating Assessment

Industry	Investment Grade		High-Yield	
	Rating Dec 31, 2019	Rating Assessment April 29, 2020	Rating Dec 31, 2019	Rating Assessment April 29, 2020
PHARMACEUTICALS	Baa2	Baa3	B2	B3
HOTELS & RESTAURANTS	Baa2	Ba2	B2	B3
TRANSPORTATION	Baa2	Ba2	B1	B2
MASS MEDIA	A2	Baa1	B3	B4
MERCHANDISE DURABLES	Baa2	Ba1	B2	B3

## PROJECTING WHAT MIGHT HAPPEN NEXT?

Varying macro scenarios



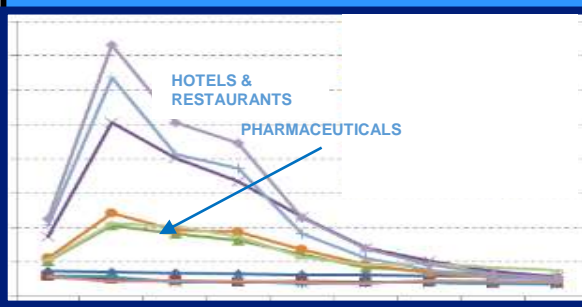
Cross-Sectional COVID-19 Overlay Model



Fiscal & Monetary Overlay Model



## PROJECTED RATINGS, AND LOSS MEASURES TO PUBLIC AND PRIVATE CORPORATES



# 2020 Expected Defaults Select Industries: December 31<sup>st</sup> Launch-Off

## Impact of Cross-Sectional COVID-19 Overlay

Average One-Year Default Probabilities (Dec 2019 to Dec 2020)

Industry	UK Moody's Rated					Germany Moody's Rated					US Moody's Rated IG				
	EDF	Baseline	Baseline	S4	S4	EDF	Baseline	Baseline	S4	S4	EDF	Baseline	Baseline	S4	S4
	31-Dec-19		With C-S COVID19 Overlay		With C-S COVID19 Overlay	31-Dec-19		With C-S COVID19 Overlay		With C-S COVID19 Overlay	31-Dec-19		With C-S COVID19 Overlay		With C-S COVID19 Overlay
AUTOMOTIVE	0.03%	1.53%	3.28%	1.61%	3.45%	0.05%	0.81%	0.94%	0.95%	1.11%	0.07%	0.28%	1.39%	0.36%	1.87%
MEDICAL EQUIPMENT	0.01%	0.30%	0.24%	0.33%	0.26%	0.03%	0.22%	0.17%	0.26%	0.21%	0.01%	0.05%	0.02%	0.06%	0.03%
FOOD & BEVERAGE	0.05%	0.24%	0.27%	0.27%	0.30%	0.03%	0.08%	0.09%	0.10%	0.11%	0.03%	0.06%	0.07%	0.08%	0.09%
BANKS AND S&LS	0.35%	4.71%	2.86%	5.21%	3.19%	0.46%	2.51%	2.06%	3.07%	2.52%	0.39%	1.34%	0.73%	1.74%	0.95%

Automotive relative performance deteriorates with C-S COVID Overlay

Banks relative performance improves with C-S COVID Overlay

### NOTES

- C-S COVID Overlay as of July 17, 2020

UK and Germany scenario more severe compared to US. Yet overlay recognizes US more sensitive to pandemic.

**U.S. Baseline:** real GDP is projected to fall almost 6% in 2020. Activity is forecasted to exhibit a W recovery, bouncing in 2020 Q3 but weakening in 2020 Q4. The peak-to-trough decline in real GDP is around 11%. The unemployment rate will remain above 6% until late 2022. This scenario assumes \$1.4 trillion in additional stimulus, almost evenly split between aid for state and local governments and for unemployment insurance benefits.

**U.K. Baseline:** the virus is assumed to be contained by end of summer, allowing activity to rebound during the second half of the year. However, recovery is not projected to be V-shaped. Real GDP falls 8.5% in 2020, returning to pre-crisis levels only by the end of 2022. Unemployment jumps to 8.4% by 2020 Q4.

**Germany Baseline:** assumes no second wave of infections in 2020 and GDP growth is projected to bounce back in the second half of the year. GDP is forecast to decline more than 6% in 2020 and Unemployment rate rises to more than 6% by 2020 Q4.

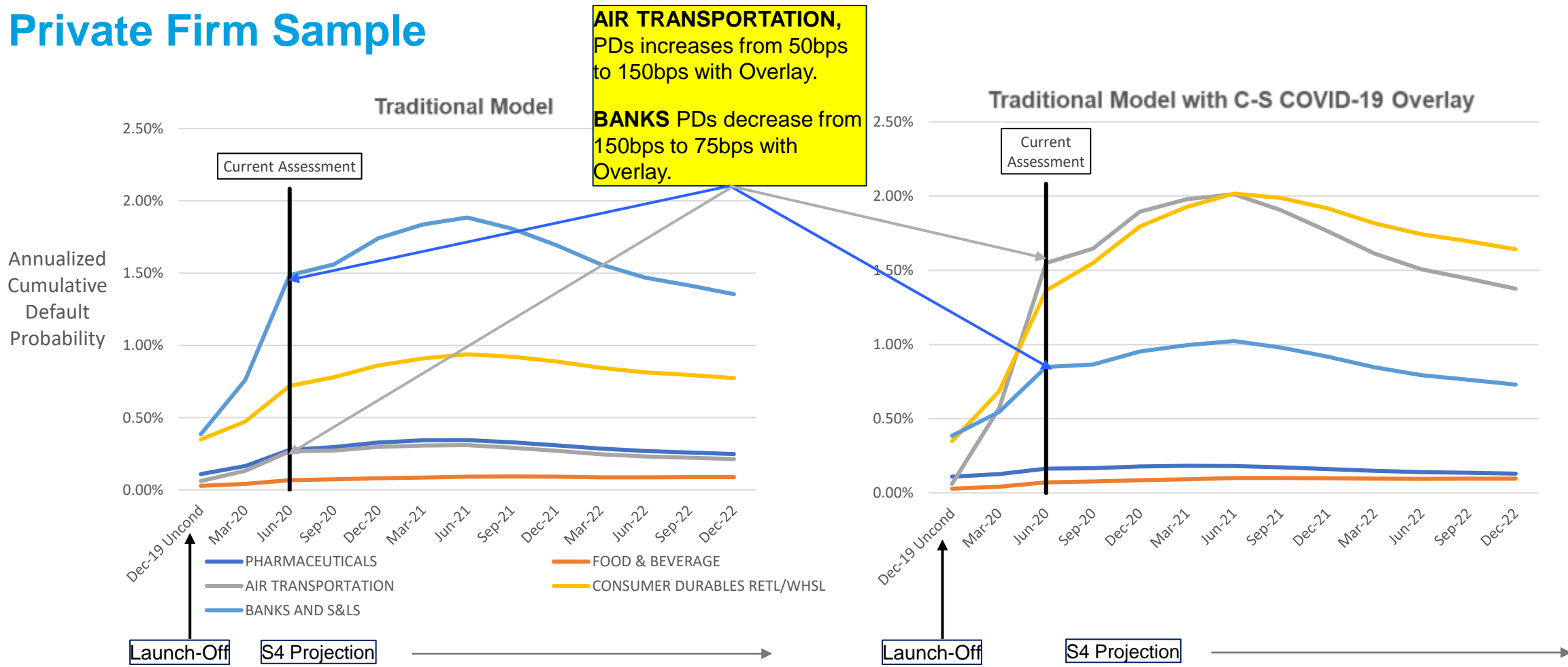
**U.S. 96th% Downside (S4):** assumes the crisis to last significantly longer with more cases and deaths than anticipated. Business closures wind down much more slowly than in the Baseline. There is a modest rebound in 2020 Q3 but a second wave of recession begins in 2020 Q4 until 2021 Q3. Real GDP is projected to fall -8% in 2020 and -5% in 2021 (compared to -5.8% and 1.6%, respectively, in the Baseline). Unemployment rate reaches a peak of 13.2% in early 2022. Disagreement in Congress prevent additional fiscal stimulus.

**U.K. 96th% Downside (S4):** assumes COVID-19 to become worse than expected, with partial restrictions on economic activity lasting well into August. Real GDP declines 10% in 2020 and contracts through 2021 until the start of 2022. It falls more than 16% peak to trough, almost three times higher the level observed during 2008-2009 recession. The unemployment rate jumps to 10.4% in 2020 Q4 and peaks at almost 12% in 2022.

**Germany 96th% Downside (S4):** assumes the crisis lasting significantly longer, with more cases and deaths than expected. Business closures wind down more slowly than in the baseline scenario, and GDP is forecast to decline close to 12% in 2020. Unemployment rises to more than 8% in 2020 Q4.

# PDs with C-S COVID-19 Overlay: Moody's S4 Scenario (96% downside)

## US Private Firm Sample

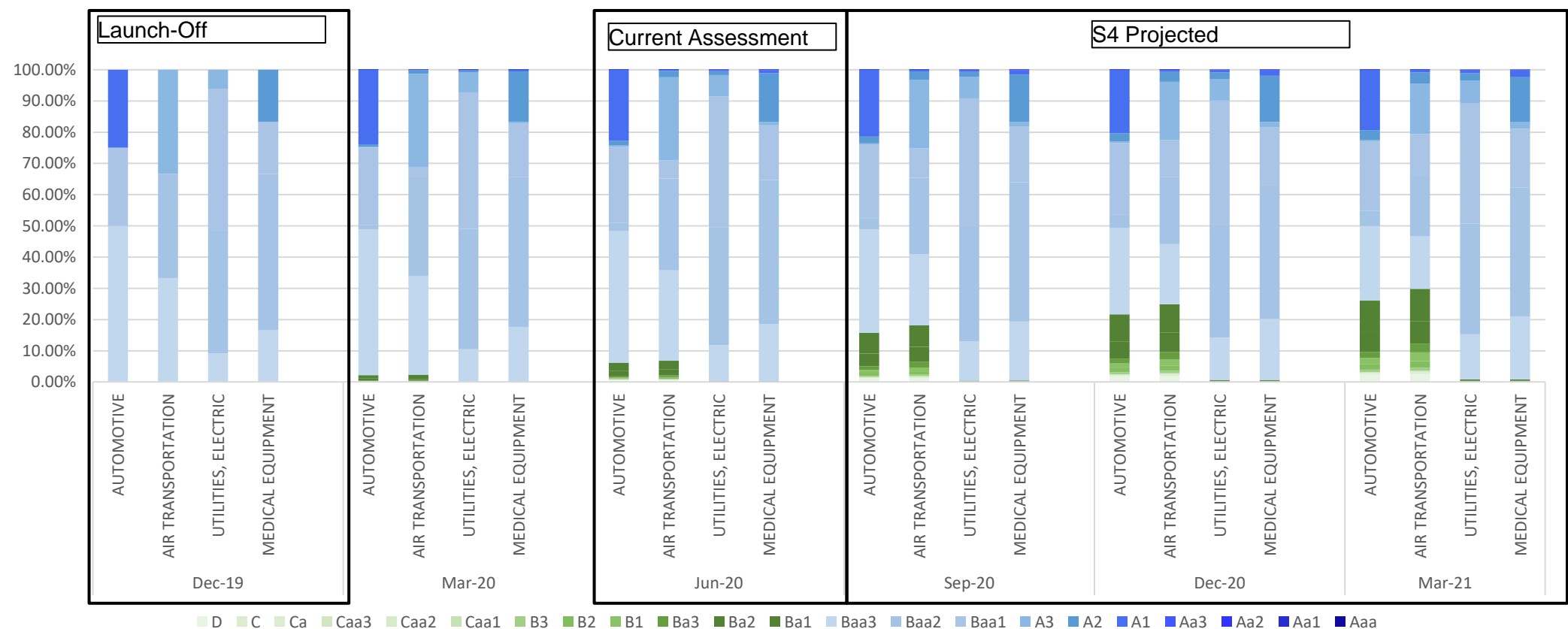


**NOTES**

- **C-S COVID Overlay:** as of July 17, 2020
- **U.S. 96th% Downside (S4):** assumes the crisis to last significantly longer with more cases and deaths than anticipated. Business closures wind down much more slowly than in the Baseline. There is a modest rebound in 2020 Q3 but a second wave of recession begins in 2020 Q4 until 2021 Q3. Real GDP is projected to fall -8% in 2020 and -5% in 2021 (compared to -5.8% and 1.6%, respectively, in the Baseline). Unemployment rate reaches a peak of 13.2% in early 2022. Disagreement in Congress prevent additional fiscal stimulus.

# Current and S4 96% Downside Projected Rating Composition

## US Moody's IG Rated Sample



**Automotive and Air Transport** experience material deterioration with majority falling below IG and entering default.

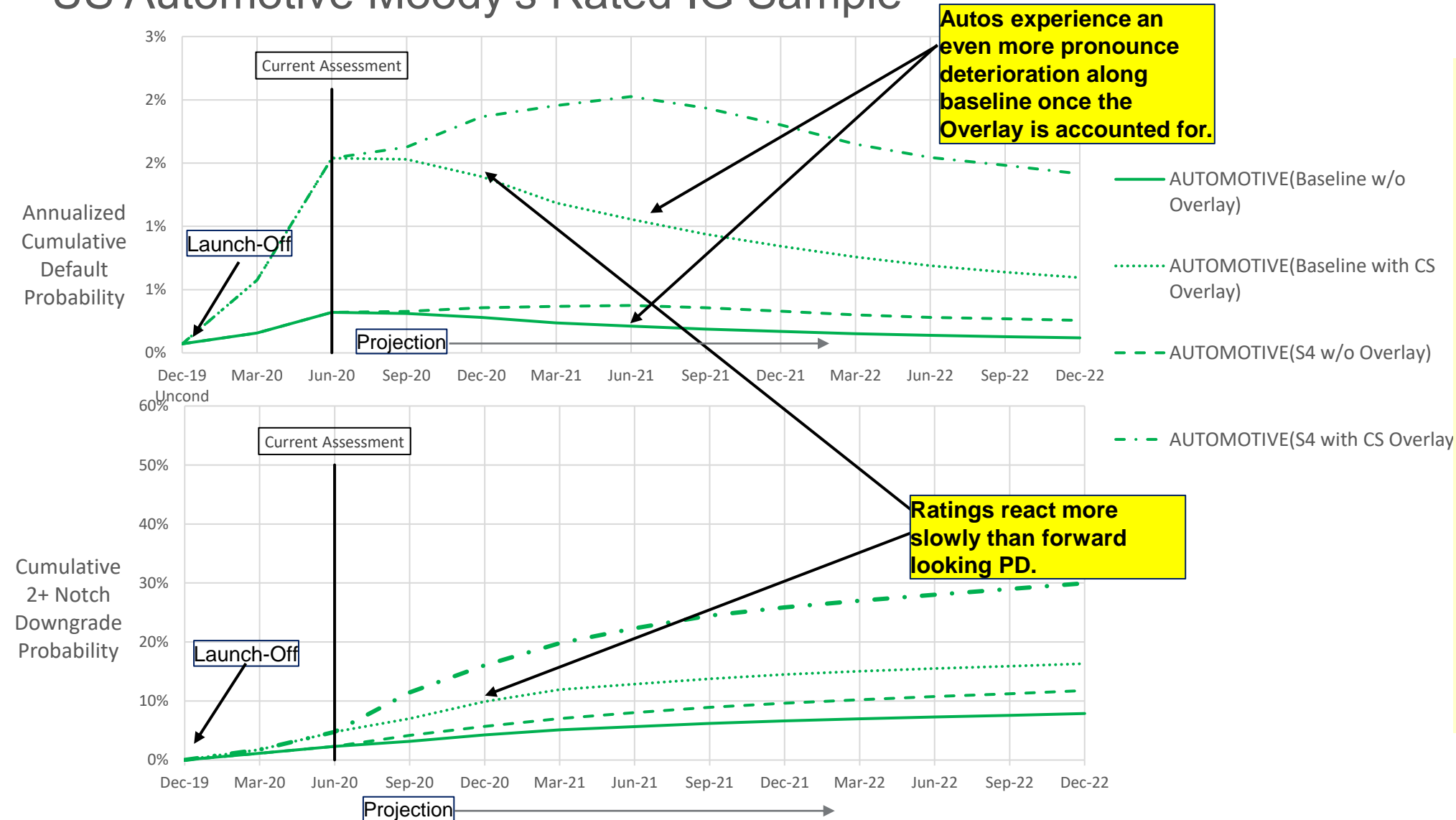
**Utilities and Medical Equipment** not impacted much by downturn.

### NOTES

- **CS Overlay:** as of July 17, 2020
- **U.S. 96th% Downside (S4):** assumes the crisis to last significantly longer with more cases and deaths than anticipated. Business closures wind down much more slowly than in the Baseline. There is a modest rebound in 2020 Q3 but a second wave of recession begins in 2020 Q4 until 2021 Q3. Real GDP is projected to fall -8% in 2020 and -5% in 2021 (compared to -5.8% and 1.6%, respectively, in the Baseline). Unemployment rate reaches a peak of 13.2% in early 2022. Disagreement in Congress prevent additional fiscal stimulus.

# Current PD and Rating Assessments and Projections

## US Automotive Moody's Rated IG Sample



### NOTES

- **C-S COVID Overlay:** as of July 17, 2020
- **U.S. Baseline:** real GDP is projected to fall almost 6% in 2020. Activity is forecasted to exhibit a W recovery, bouncing in 2020 Q3 but weakening in 2020 Q4. The peak-to-trough decline in real GDP is around 11%. The unemployment rate will remain above 6% until late 2022. This scenario assumes \$1.4 trillion in additional stimulus, almost evenly split between aid for state and local governments and for unemployment insurance benefits.
- **U.S. 96th% Downside (S4):** assumes the crisis to last significantly longer with more cases and deaths than anticipated. Business closures wind down much more slowly than in the Baseline. There is a modest rebound in 2020 Q3 but a second wave of recession begins in 2020 Q4 until 2021 Q3. Real GDP is projected to fall -8% in 2020 and -5% in 2021 (compared to -5.8% and 1.6%, respectively, in the Baseline). Unemployment rate reaches a peak of 13.2% in early 2022. Disagreement in Congress prevent additional fiscal stimulus.

# Impact of Fiscal and Monetary Actions

## US Moody's IG Sample: Equally weighted 2020 expected defaults

Industry	EDF 31-Dec-19	Baseline w/o C-S COVID Overlay	Baseline with C-S COVID Overlay	Baseline with C-S COVID and F&M Overlay	S4 w/o C-S COVID Overlay	S4 with C-S COVID Overlay	S4 with C-S COVID and F&M Overlay
AUTOMOTIVE	0.07%	0.28%	1.39%	1.31%	0.36%	1.87%	1.60%
AIR TRANSPORTATION	0.06%	0.23%	1.41%	1.29%	0.30%	1.90%	1.72%
UTILITIES, ELECTRIC	0.03%	0.07%	0.06%	0.05%	0.09%	0.07%	0.07%
PHARMACEUTICALS	0.11%	0.26%	0.14%	0.14%	0.33%	0.18%	0.18%
FOOD & BEVERAGE	0.03%	0.06%	0.07%	0.07%	0.08%	0.09%	0.08%
TRANSPORTATION	0.09%	0.26%	0.56%	0.54%	0.33%	0.75%	0.69%
BANKS AND S&LS	0.39%	1.34%	0.73%	0.73%	1.74%	0.95%	0.95%

Automotive relative performance deteriorates with C-S COVID Overlay and bolstered by F&M programs

Food and Beverage relative unaffected by C-S COVID Overlay and not particularly affected by F&M programs.

**Baseline:** real GDP is projected to fall almost 6% in 2020. Activity is forecasted to exhibit a W recovery, bouncing in 2020 Q3 but weakening in 2020 Q4. The peak-to-trough decline in real GDP is around 11%. The unemployment rate will remain above 6% until late 2022. This scenario assumes \$1.4 trillion in additional stimulus, almost evenly split between aid for state and local governments and for unemployment insurance benefits.

**96th% Downside (S4):** assumes the crisis to last significantly longer with more cases and deaths than anticipated. Business closures wind down much more slowly than in the Baseline. There is a modest rebound in 2020 Q3 but a second wave of recession begins in 2020 Q4 until 2021 Q3. Real GDP is projected to fall -8% in 2020 and -5% in 2021 (compared to -5.8% and 1.6%, respectively, in the Baseline). Unemployment rate reaches a peak of 13.2% in early 2022. Disagreement in Congress prevent additional fiscal stimulus.

**Fiscal & Monetary Overlay (F&M Overlay):** assumes a new round of stimulus programs, similar in size and scope to existing programs.

### NOTES

- CS Overlay as of July 17, 2020
- Fiscal & Monetary Overlay as of July 17, 2020
- Portfolio includes US investment grade firms.

# Pandemic Credit Data and Analytics (PCDA)

## Fiscal and Monetary Action Settings

Select Existing Scenario
New Scenario Name

Add Fiscal & Monetary Overlay

Name	Included	Size (USD billion)	Country	Type	Target Size	Target Credit Quality	Target Industry Code	Starting Quarter
Direct payments to taxpayers	Yes	\$ 300.00	USA	Consumer_spending	ALL	ALL	ALL	2020-Q2
Increase jobless benefits	Yes	\$ 260.00	USA	Consumer_spending	ALL	ALL	ALL	2020-Q2
Student loans	Yes	\$ 7.92	USA	Consumer_spending	ALL	ALL	ALL	2020-Q2
PPP loans	Yes	\$ 395.40	USA	Consumer_spending	ALL	ALL	ALL	2020-Q2
Defense Industry Bailout	Yes	\$ 17.00	USA	Bailout	ALL	ALL	N01	2020-Q2
Airline Bailout	Yes	\$ 50.00	USA	Bailout	ALL	ALL	N03	2020-Q2
Commercial Paper Funding Facility	Yes	\$ 100.00	USA	Subsidized_lending	ALL	IG	ALL	2020-Q2
Money Market Fund Liquidity Facility	Yes	\$ 100.00	USA	Subsidized_lending	ALL	IG	ALL	2020-Q2
Main Street Lending Program	Yes	\$ 600.00	USA	Subsidized_lending	TS1,TS2	ALL	ALL	2020-Q2
Primary Market Corporate Credit Facility	Yes	\$ 500.00	USA	Subsidized_lending	ALL	IG	ALL	2020-Q2
Municipal Liquidity Facility	Yes	\$ 350.00	USA	Subsidized_lending	ALL	IG	ALL	2020-Q2
Secondary Market Corporate Credit Facility	Yes	\$ 250.00	USA	Subsidized_lending	ALL	IG	ALL	2020-Q2
Term Asset-Backed Securities Loan Facility	Yes	\$ 100.00	USA	Subsidized_lending	ALL	ALL	ALL	2020-Q2
Bankers' Acceptance Purchase Facility	Yes	\$ 6.30	CAN	Subsidized_lending	ALL	ALL	ALL	2020-Q2
BCAP BDC Co-Lending to SMEs	Yes	\$ 15.00	CAN	Subsidized_lending	TS1,TS2	ALL	ALL	2020-Q2
BCAP BDC MidMarket Financing Program	Yes	\$ 15.00	CAN	Subsidized_lending	TS2	ALL	ALL	2020-Q2
BCAP EDC Guarantee for SMEs	Yes	\$ 15.00	CAN	Subsidized_lending	TS1,TS2	ALL	ALL	2020-Q2
BCAP EDC MidMarket Guarantee and Financing Program	Yes	\$ 15.00	CAN	Subsidized_lending	TS2	ALL	ALL	2020-Q2
Large Employer Emergency Financing Facility	Yes	\$ 15.00	CAN	Subsidized_lending	TS3	ALL	ALL	2020-Q2
Canada Emergency Business Account	Yes	\$ 18.75	CAN	Subsidized_lending	ALL	ALL	ALL	2020-Q2
Canada Emergency Wage Subsidy	Yes	\$ 57.00	CAN	Consumer_spending	ALL	ALL	ALL	2020-Q2
Canada Emergency Response Benefit	No	\$ 26.63	CAN	Consumer_spending	ALL	ALL	ALL	2020-Q2
Canada Emergency Student Benefit	Yes	\$ 3.98	CAN	Consumer_spending	ALL	ALL	ALL	2020-Q2
Increasing Credit Availability to Agriculture and Food Processing	Yes	\$ 3.75	CAN	Subsidized_lending	ALL	ALL	N02,N25	2020-Q2
Increasing the Canada Child Benefit	Yes	\$ 1.43	CAN	Consumer_spending	ALL	ALL	ALL	2020-Q2
Cleaning up Orphan and Inactive Gas Wells	Yes	\$ 1.28	CAN	Direct_grant	ALL	ALL	N40	2020-Q2

# Pandemic Credit Data and Analytics (PCDA)

## Projected Rating Migrations

Select Analysis 1

Sample\_S3\_Covid\_20200729074355

Segmentation	Segment
Custom 2	Hotels

Number of Notch Downgraded

2

Select Analysis 2

Sample\_S3\_Covid\_20200729074355

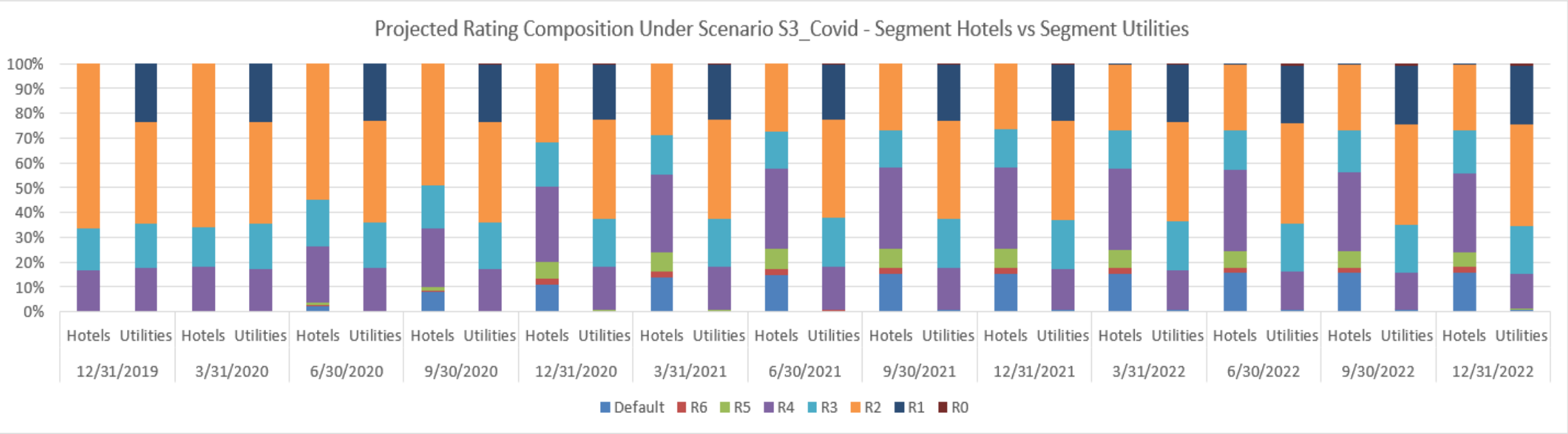
Segmentation	Segment
Custom 2	Utilities

Use Internal Rating

Yes

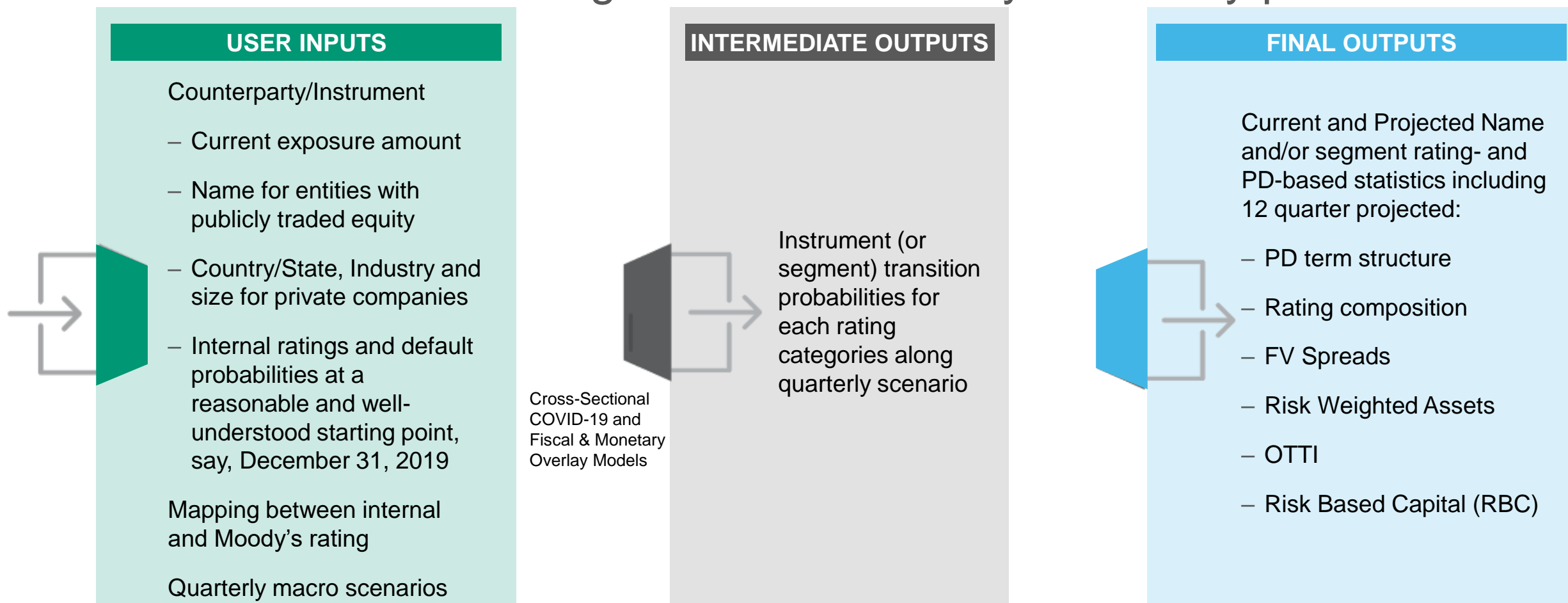
Calculate

Segment Level Report



# Current Internal Rating Assessment/Projected Ratings and Loss Measures

API schematics aligned with internal system entry points



# Beyond COVID-19

## Preparing for the “Unknown Unknowns”

- » Navigating the uncertainty of COVID-19 is causing a re-evaluation of common risk factors.
- » Exposure to climate risk – supply chain risk driven by common exposure to typhoon risks off the coast of Malaysia
- » Emerging concentration risks are shifting our views of geospatial dynamics
- » How can we design analytics to help us navigate this change?



# Key Takeaways



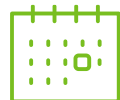
Managing credit portfolios in the current environment is a challenge we've never experienced.



Requires a unique data set and analytics updated frequently



Across a range of economic paths, inclusive of fiscal stimulus actions



With multiple applications to help institutions manage risk



MOODY'S  
ANALYTICS

*Better  
Faster  
Decisions*

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

© 2020 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 OR IMPAIRMENT. SEE MOODY'S RATING SYMBOLS AND DEFINITIONS PUBLICATION FOR INFORMATION ON THE TYPES OF CONTRACTUAL FINANCIAL OBLIGATIONS ADDRESSED BY MOODY'S RATINGS. 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.

CREDIT RATINGS AND MOODY'S PUBLICATIONS ARE NOT INTENDED FOR USE BY ANY PERSON AS A BENCHMARK AS THAT TERM IS DEFINED FOR REGULATORY PURPOSES AND MUST NOT BE USED IN ANY WAY THAT COULD RESULT IN THEM BEING CONSIDERED A BENCHMARK.

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 CREDIT 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 ratings opinions and services rendered by it fees ranging from \$1,000 to approximately \$2,700,000. 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.moody.com](http://www.moody.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.

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 ratings opinions and services rendered by it fees ranging from JPY125,000 to approximately JPY250,000,000.

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