

RatingsDirect®

General Criteria:

Methodology: Industry Risk

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General Criteria:

Methodology: Industry Risk

1. Standard & Poor's Ratings Services is updating its methodology for measuring and calibrating global industry risk. The criteria will help market participants better understand our revised approach to evaluating industry risk for nonfinancial corporate entities and U.S. public finance and international public finance enterprises. The criteria supersede the industry risk segments of: "2008 Corporate Criteria: Analytical Methodology," published April 15, 2008, "Public And Nonprofit Social Housing Providers: Methodology And Assumptions," published July 11, 2012, and "Bond Insurance Rating Methodology And Assumptions," published Aug. 25, 2011.
2. The criteria constitute specific methodologies and assumptions under "Principles Of Credit Ratings," published Feb. 16, 2011.

SCOPE OF THE CRITERIA

3. The criteria apply to global corporate ratings (see "Corporate Methodology," published Nov. 19, 2013). The corporate criteria framework incorporates an entity-level industry risk assessment as one of the three anchor assessments--together with the country risk assessment and a competitive position assessment--that we would use to derive the business risk profile assessment for the rated corporate entity.
4. We expect these criteria to apply to other sectors in the future upon publication of sector-specific criteria that describe the use of the industry risk assessment for that sector.

SUMMARY OF THE CRITERIA

5. Our industry risk criteria enhance the comparability and transparency of ratings across sectors by comparing and scoring interindustry risk. The methodology addresses the major industry risk factors that entities face.
6. The criteria use two factors for calculating a global industry risk assessment:
 - Cyclicalities, and
 - Competitive risk and growth.
7. Each of the two factors receives an assessment from 1 (very low risk) to 6 (very high risk). The combination of these assessments determines the global industry risk assessment, which uses the same 1 to 6 scale (see table 1).
8. We calibrate an industry's cyclicalities assessment (see section A) using the hypothetical stress scenarios in "Understanding Standard & Poor's Rating Definitions," published June 3, 2009, which we use to enhance ratings comparability.
9. The analysis of a sector's overall competitive risk and growth environment (see section B) addresses on an industry-aggregate level the:

- Effectiveness of industry barriers to entry;
- Level and trend of industry profit margins;
- Risk of secular change and substitution of products, services, and technologies; and
- Risk in growth trends.

10. The risks within different subsectors of an industry are captured within the analysis of a firm's competitive position.

IMPACT ON OUTSTANDING RATINGS

11. We do not expect these criteria, in and of themselves, to result in any rating changes.

EFFECTIVE DATE AND TRANSITION

12. These criteria are immediately effective upon publication.

METHODOLOGY

13. The industry risk criteria consider two factors in the calculation of a global industry risk assessment:

- Cyclicalities, and
- Competitive risk and growth.

14. We assess each factor according to the following scale: very low risk (1), low risk (2), intermediate risk (3), moderately high risk (4), high risk (5), and very high risk (6). These assessments are based on a series of quantitative and qualitative considerations. Combined, they determine the global industry risk assessment (see table 1).

15. The criteria weight competitive risk and growth more heavily than cyclicalities because competitive risk and growth is a prospective analysis, and the cyclicalities assessment is based on historical data.

Table 1

Determining A Global Industry Risk Assessment						
--Competitive risk and growth assessment--						
	Very low risk	Low risk	Intermediate risk	Moderately high risk	High risk	Very high risk
Cyclicalities assessment						
Very low risk	1	2	3	4	5	6
Low risk	1	2	3	4	5	6
Intermediate risk	2	2	3	4	5	6
Moderately high risk	3	3	3	4	5	6
High risk	3	4	4	5	5	6
Very high risk	4	4	5	5	6	6

A. Cyclicalities

16. Cyclicalities is the first factor in the global industry risk assessment under the criteria and has two subfactors: cyclicalities of industry revenue and cyclicalities of industry profitability.
17. We generally consider the more cyclical an industry's level of profits, the more this factor will contribute to credit risk for the entities operating in that industry. However, the overall effect of cyclicalities on an industry's risk profile may be mitigated or exacerbated by an industry's competitive risk and growth environment.
18. The criteria assign a heavier weighting to an industry's profitability cyclicalities assessment than to its revenue cyclicalities assessment to calculate the industry cyclical risk assessment. The reason for this is the importance of an entity maintaining adequate profitability to service its cash flow needs, including its working capital and debt service requirements. Although a company's level and volatility of cash flows are often a better measure of its credit strength than its profitability, we have used the cyclicalities of an industry's level of profits in the criteria as a proxy for cash flows due to the lack of globally consistent and comparable data. Profitability measures also exclude distortions to industry cyclicalities measurements that working capital movements (that are not reflective of credit risk) would have on cash flow measurements.
19. We calibrate the cyclicalities assessments with stress scenarios to enhance ratings comparability across sectors and time. As part of our calibration, we calculated the peak-to-trough changes in U.S. sector revenues during the first leg of the Great Depression (from August 1929 to March 1933). In the second phase of the cyclicalities calibration, we focused on analyzing industry revenue and EBITDA margin performance in recessions from 1950 to 2010 in the U.S. and from 1987 to 2010 in other major economies. The cyclicalities assessments are calibrated against 'BBB' and 'BB' stresses/recessions during this time period (see Appendix IV of "Understanding Standard & Poor's Rating Definitions," published June 3, 2009). To calibrate the cyclicalities component of these criteria, we performed a peak-to-trough analysis of industry revenues and profitability in these recessionary periods.
20. We consider cyclicalities calibration as a key component of these criteria because of the importance of cyclicalities in determining an industry's and entity's level of credit risk. Historical research demonstrates that industries vary significantly in their degree of revenue and profitability cyclicalities (see Appendix I). Table 2 shows the methodology we use to determine the rank ordering of the degree of cyclicalities between industries, and Appendix I provides a compendium of our rank ordering of industry revenue and profitability cyclicalities.
21. The criteria divide the cyclical peak-to-trough declines in revenue and profitability into ranges and assign each an assessment, from 1 to 6. The categories are: very low risk (1), low risk (2), intermediate risk (3), moderately high risk (4), high risk (5), and very high risk (6).
22. The statistical technique we used to establish the buckets in table 2 is based on a k-means clustering methodology (see Appendix II for an explanation).

Table 2

Determining An Industry's Cyclical Risk Assessment						
	Profitability ratio either increases or declines by up to 3% during a cyclical downturn	Profitability ratio declines between 3% and up to 7% during a cyclical downturn	Profitability ratio declines between 7% and up to 12% during a cyclical downturn	Profitability ratio declines between 12% and up to 24% during a cyclical downturn	Profitability ratio declines between 24% and up to 72% during a cyclical downturn	Profitability ratio declines more than 72% during a cyclical downturn
Industry revenues either increase or decline by up to 4% during a cyclical downturn	1	2	3	4	5	6
Industry revenues decline between 4% and up to 8% during a cyclical downturn	1	2	3	4	5	6
Industry revenues decline between 8% and up to 13% during a cyclical downturn	1	2	3	4	5	6
Industry revenues decline between 13% and up to 20% during a cyclical downturn	2	3	3	4	5	6
Industry revenues decline between 20% and up to 32% during a cyclical downturn	2	3	4	4	5	6
Industry revenues decline by more than 32% during a cyclical downturn	3	3	4	5	5	6

23. Sectors with higher cyclical profitability include mineral-based, metals, and building products industries (see Appendix I). This is because demand for their products comes, to a great extent, from industries that produce discretionary consumer and capital goods, which also tend to demonstrate greater cyclical profitability than many other sectors.
24. Overbuilding of production capacity in an industry will create more competitive and earnings pressure, especially in

the event of a cyclical downturn in demand.

25. Companies operating in cyclical industries need to be able to reduce their cost bases in a downturn as revenues decline. Therefore, industry risk is greater for cyclical industries with high fixed costs, such as the auto industry.

B. Competitive Risk And Growth

26. The second factor under the criteria is competitive risk and growth. The criteria assess four subfactors as low, medium, or high risk (see table 3). These subfactors are:
- Effectiveness of barriers to entry;
 - Level and trend of industry profit margins;
 - Risk of secular change and substitution of products, services, and technologies; and
 - Risk in growth trends.
27. The criteria then combine these subfactor assessments to produce a competitive risk and growth assessment, from 1 to 6 (see table 4).

Table 3

Assessing The Competitive Risk And Growth Subfactors

Subfactor	Low risk	Medium risk	High risk
a) Effectiveness of barriers to entry (see paragraph 28)	Barriers to entry are high and are effective in limiting competitive entrants.	Barriers to entry are limited but partially effective in excluding competitive entrants.	Barriers to entry are either very low or nonexistent.
b) Level and trend of industry profit margins (see paragraphs 29 and 30)	Industry participants demonstrate stable or increasing operating profit margins.	Operating margins are under moderate competitive pressure.	Material prospective or actual pressure on operating margins. Alternatively, margins may be increasing unsustainably and creating the risk of a collapse in industry profitability.
c) Risk of secular change and substitution of products, services, and technologies (see paragraph 31)	No discernible substitution risk from outside the industry.	Limited likelihood of substitution risk from outside the industry.	High risk of prospective or actual substitution from outside the industry.
d) Risk in growth trends (see paragraph 32)	Established industry where sales are rising over the medium term at a rate equal to or faster than nominal GDP growth.	Established industry where sales are rising between 1% and the rate of nominal GDP growth over the medium term, given that nominal GDP growth is greater than 1%.	Established industry where sales are either rising by less than 1%, or are declining, over the medium term. This category also includes start-up industries, which may be high growth, with unproven growth records.

Table 4

Determining The Industry Competitive Risk And Growth Assessment

Competitive risk and growth assessments	Combination of assessments from table 3
1. Very low risk	All of the subfactors are low risk.
2. Low risk	Three of the subfactors are low risk, and one subfactor is medium risk.
3. Intermediate risk	(i) Three subfactors are medium risk and one is medium or low risk; (ii) Two subfactors are medium risk and two are low risk; or (iii) One subfactor is high risk, and the other three are any combination of low and/or medium risk.*
4. Moderately high risk	Two of the subfactors are assessed as high risk, and the other two are medium or low risk.
5. High risk	Three of the subfactors are high risk, and one is medium or low risk.

Table 4**Determining The Industry Competitive Risk And Growth Assessment (cont.)**

6. Very high risk	All four of the subfactors are high risk.
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*If either barriers to entry or substitution risk is assessed as high risk, competitive risk and growth is assigned an assessment of '4' (moderately high risk).

1. Competitive risk and growth subfactors**a) Effectiveness of barriers to entry**

28. Industries that benefit from meaningful barriers to entry generally have materially lower competitive risk than those that have low or no barriers. Barriers to entry include:

- Government-related factors such as regulation, licensing, approvals, tariffs, taxation, and government industry ownership and controls. These elements may lower competition and stabilize EBITDA and cash flows. In some instances, governments may grant monopolies or oligopolies in industries such as regulated utilities, telecommunications, and airlines.
- Patents, research capabilities, and scientific and technological know-how. These can create substantial competitive advantage for a period of time for established entities, as well as barriers against would-be entrants, in industries such as pharmaceuticals, biotechnology, high technology, specialty chemicals, and aerospace.
- Capital intensity. Industries that require large capital outlays, especially those with a long-term return horizon, present a major obstacle for entities attempting to break in because their access to debt and equity financing is often weaker than that of industry incumbents. Industries where these characteristics are present include regulated utilities, steel, autos, and aerospace.
- Industry structure that creates cost advantages for incumbents. For example, transportation and distribution infrastructure and vertical integration of production can make it difficult for challengers to establish themselves profitably. Industries where these characteristics are present include forest products, integrated oil, and mining.
- Industry consolidation and concentration. This can lead to limited competition and greater size and efficiency for incumbents, including oligopolistic and monopolistic market positions in such sectors as steel, chemicals, branded consumer products, and patented/branded pharmaceuticals.
- Brand power, such as established profitable brands that make it difficult and costly for entrants to build competitive brands and gain customer recognition. Industries where strong brands can provide a real advantage include luxury and big box retail, autos, consumer technology, and consumer staples.

b) Level and trend of industry profit margins

29. This subfactor evaluates the effect that an industry's competitive conditions, operating dynamics, and cost structure and volatility have on margins--as opposed to the economic cyclicity of profit margins. The criteria evaluate both the level and trends of an industry's margins. The methodology does not specifically measure and assess competitive and operating risk and cost elements affecting industry operating margins because these are already captured in the cost side of an industry's profit margin.

30. Some major industry competitive and operating cost considerations that we view as affecting industry operating margins include:

- Level of competition in an industry, including the basis for/nature of its competition
- Production input costs and related volatility (such as energy, raw material, and component prices)
- Asset and commodity price bubble-and-bust risk
- Labor costs and practices risk

- Customer and supplier concentrations and pricing power
- Asset quality costs, including property, plant, and equipment upkeep in capital-intensive industries
- Natural and manmade catastrophic event risk. Manmade catastrophes include nuclear, chemical plant, and oil drilling accidents, and associated costs.
- Technological change in an industry and related costs and risk dynamics
- Legal risks and costs
- Government regulation, taxation, and ownership policies

c) Risk of secular changes and substitution of products, services, and technologies

31. This section of the criteria covers secular changes in an industry that can affect its internal competitive and risk profile. In addition, competition from other industries or from an innovative company within the industry providing alternative technologies or products can have a negative impact on industry revenues, margins, cash flows, and credit quality. This form of substitution or competition can, in extreme cases, shutter an entire industry.

d) Risk in growth trends

32. A healthy growth outlook for a well-established industry can be a key positive factor in the industry's risk profile. Conversely, a long-term trend of, or prospects for, declining revenues is a major industry risk. Very rapid industry growth can also be a major generator of risk when an industry is young, growing from a low revenue base, or uses new technology or a business model with unproven long-term commercial viability.

RELATED CRITERIA AND RESEARCH

- Corporate Methodology, Nov. 19, 2013
- Public And Nonprofit Social Housing Providers: Methodology And Assumptions, July 11, 2012
- Principles Of Credit Ratings, Feb. 16, 2011
- Understanding Standard & Poor's Rating Definitions, June 3, 2009

APPENDIX I

33. We based our global peak-to-trough (PTT) change analysis for industry EBITDA margins and revenues on Compustat data for major recessions ('BBB' and 'BB' stress) mapped to specific industry sectors (see tables 5 and 6). The Compustat data cover the U.S. and other major economies, including Canada, the eurozone, the U.K., and Australia. The tables do not include data on China because its economy experienced no recessions for the period that Compustat data were available. Empty cells in the table represent recessionary periods before sector data were available. Compustat's non-U.S. industry data go back to 1987, versus its U.S. data, which go back to the 1950s, 1960s, or 1970s for many industries. Because of this, the only major recessionary period ('BBB' stress) we analyzed for industries outside the U.S. was the 2007-2009 downturn.

Computing industry revenues and profitability margins in a recession

34. In calculating an industry's sales, we determine the group of companies that report sales data for every year of a particular recession in each industry. We use this group of companies to compute the average sales (after applying a deflationary multiplier to account for inflation) for each year of that recession.

35. For the profitability margin, we use the ratio of EBITDA to sales margins for each year in the data set. To compute these profitability margins, we first selected the universe of companies in a given year and industry in which sales and EBITDA are reported. The profitability margin for that year equals the sum of all companies' EBITDA divided by the sum of all companies' sales.

Calculating industry peak-to-trough declines

36. For purposes of calculating the industry PTT change in sales and profitability, we begin by taking the relevant data for the year before recession. For most industries, we calculate the PTT decline from the year before the recession to the year the recession ends. However, some industries will lag the economic cycle. For these industries, we include any decreases in sales and profitability in the year after the end of the economic downturn in the PTT calculation.
37. We measure an industry's PTT sales and profitability declines by determining the average percentage decline for each 'BBB' and 'BB' stress recession since 1950 on which Compustat has data. For a given recession, we determine the maximum percentage decline in sales and profitability margin throughout the period but set this PTT decline to 0% if the profitability margin strictly increases throughout the period.

Table 5

EBITDA Margin PTT Declines (%)										
Industry	Average PTT decline	--PTT decline by recession--								
		1952-1955	1956-1958	1959-1962	1968-1971	1972-1975	1979-1982	1989-1992	2000-2002	2007-2009
Transportation cyclical	(59.1)							(42.3)	(93.4)	(41.7)
Auto OEM	(38.0)	(18.1)	(22.8)	(4.6)	(34.1)	(49.5)	(79.5)	(39.9)	(27.9)	(65.4)
Metals and mining downstream	(30.8)	0.0	(7.0)	(13.2)	(25.2)	(24.0)	(56.3)	(52.4)	(27.3)	(71.4)
Metals and mining upstream	(30.0)	(9.9)	(29.9)	(7.0)	(16.1)	(8.6)	(64.3)	(40.3)	(37.7)	(55.8)
Homebuilders and developers	(26.0)			0.0	(2.4)	(52.9)	(34.8)	(36.6)	0.0	(55.4)
Oil and gas refining and marketing	(22.1)	(5.9)	(15.9)	(2.8)	(30.3)	(25.7)	(36.8)	(20.3)	(11.3)	(50.0)
Forest and paper products	(19.6)	(3.8)	(9.5)	(20.0)	(23.8)	(13.4)	(41.5)	(33.8)	(18.1)	(12.4)
Building materials	(16.1)	0.0	(15.7)	(18.4)	(18.6)	(7.0)	(32.1)	(30.6)	(7.3)	(15.5)
Oil and gas integrated, exploration and production	(15.5)	(6.2)	(17.4)	(2.9)	(4.4)	(19.0)	(27.5)	(22.2)	(12.2)	(27.4)
Agribusiness and commodity foods	(15.3)	(4.5)	(7.6)	(4.2)	(12.5)	(1.0)	(25.4)	(31.4)	0.0	(50.9)
Leisure and sports	(14.9)	(16.2)	(9.8)	(28.7)	(30.4)	(15.7)	(14.1)	(8.4)	0.0	(10.6)
Commodity chemicals	(14.8)	(7.2)	(9.9)	(10.2)	(15.8)	(7.5)	(16.4)	(27.5)	(27.4)	(11.0)
Auto suppliers	(13.5)	(6.5)	(6.2)	(12.5)	(17.9)	(20.2)	(11.9)	(10.0)	(18.8)	(17.5)
Aerospace and defense	(12.9)	(7.2)	(16.4)	(25.6)	(11.7)	(12.1)	(13.1)	(6.3)	(9.6)	(13.9)

Table 5

EBITDA Margin PTT Declines (%) (cont.)										
Technology hardware and semiconductors	(12.8)	(8.0)	(2.4)	(3.3)	(12.0)	(4.9)	(7.7)	(18.7)	(42.3)	(16.3)
Specialty chemicals	(11.5)	0.0	(9.3)	(12.6)	(11.1)	(21.2)	(19.0)	0.0	(14.0)	(15.9)
Capital goods	(11.1)	(13.1)	0.0	(17.7)	(8.4)	(3.1)	(20.3)	(5.5)	(10.3)	(21.8)
Engineering and construction	(10.9)	(12.0)	(7.5)	(10.6)	(29.8)	(12.5)	(6.5)	0.0	(16.6)	(2.5)
Real estate investment trusts (REITs)	(10.8)				(15.4)	(33.3)	(2.9)	(9.1)	(3.9)	0.0
Railroads and package express	(10.6)							(8.6)	(8.3)	(14.8)
Business and consumer services	(10.2)	(50.0)	(9.2)	0.0	(6.6)	(9.6)	(10.7)	(1.9)	0.0	(4.0)
Midstream energy	(10.0)		0.0	(4.8)	(12.0)	(12.2)	(13.2)	(19.2)	(9.5)	(8.8)
Technology software and services	(9.4)	(13.3)	0.0	(4.4)	(28.8)	(24.6)	(3.1)	0.0	0.0	(10.5)
Consumer durables	(9.9)	(1.0)	(7.9)	(10.7)	(12.1)	(18.4)	(7.3)	(2.3)	(11.6)	(18.1)
Containers and packaging	(8.8)	0.0	(0.8)	(8.9)	(15.9)	(6.3)	(24.2)	(10.6)	(6.3)	(6.5)
Media and entertainment	(8.1)	0.0	0.0	(17.4)	(19.4)	(7.2)	(8.0)	(6.3)	(7.5)	(6.9)
Oil and gas drilling, equipment and services	(7.7)	0.0	(5.8)	(8.5)	(21.6)	(0.4)	(4.6)	(5.6)	(13.5)	(9.0)
Retail and restaurants	(7.1)	(1.9)	(6.2)	(9.5)	(9.0)	(13.1)	(7.1)	(9.9)	(1.1)	(5.6)
Health care services	(6.2)				(5.7)	(16.6)	(1.6)	(6.8)	(2.5)	(3.8)
Transportation infrastructure	(6.1)									(6.1)
Environmental services	(6.0)			(4.9)	(10.9)	(6.7)	0.0	(8.4)	(1.3)	(9.9)
Regulated utilities	(5.3)	0.0	0.0	(5.3)	(11.2)	(16.6)	(8.4)	(1.9)	0.0	(4.3)
Unregulated power and gas	(5.3)	0.0	0.0	(5.3)	(11.2)	(16.6)	(8.4)	(1.9)	0.0	(4.3)
Pharmaceuticals	(4.0)	0.0	(5.4)	(3.1)	(9.0)	(7.4)	(3.7)	(1.7)	(3.5)	(1.8)
Transportation leasing	(3.7)	(8.2)	0.0	0.0	(7.6)	(3.9)	(4.7)	(3.8)	0.0	(5.2)
Telecommunications and cable	(3.3)						(5.3)	(2.6)	(0.4)	(5.1)
Health care equipment	(3.3)	(8.5)	0.0	0.0	(11.1)	(3.4)	(4.5)	0.0	0.0	(1.8)
Branded nondurables	(3.2)	0.0	0.0	(2.6)	(4.6)	(9.8)	(0.3)	(3.6)	(2.2)	(5.4)

Note: Empty cells in the table refer to recessionary periods before sector data were available.

Table 6

Revenue PTT Declines (%)										
Industry	Average PTT decline	--PTT decline by recession--								
		1952-1955	1956-1958	1959-1962	1968-1971	1972-1975	1979-1982	1989-1992	2000-2002	2007-2009
Homebuilders and developers	(20.1)				0.0	(31.1)	(26.4)	(18.8)	0.0	(44.5)
Metals and mining downstream	(17.4)	(16.1)	(21.1)	(8.1)	(6.1)	(16.0)	(24.2)	(24.2)	(6.5)	(34.3)
Auto OEM	(16.5)	(10.3)	(24.0)	(5.8)	(16.9)	(15.7)	(30.0)	(8.2)	(6.9)	(30.7)
Midstream energy	(15.3)			(0.4)	(3.4)	0.0	(2.6)	(12.1)	(59.3)	(29.2)
Metals and mining upstream	(12.6)	(1.4)	(27.4)	(1.3)	(8.2)	(7.3)	(25.9)	(15.5)	(5.7)	(20.6)
Oil and gas refining and marketing	(11.7)	(15.2)	(18.0)	(2.4)	0.0	(2.1)	(11.5)	(15.4)	(9.5)	(31.4)
Transportation cyclical	(10.7)							(0.2)	(14.7)	(17.3)
Auto suppliers	(9.5)	(10.4)	(8.1)	(6.7)	(5.4)	(6.1)	(20.3)	(5.2)	(4.9)	(18.9)
Building materials	(8.0)	(1.8)	(6.3)	(2.2)	0.0	(8.4)	(23.6)	(11.5)	(1.5)	(16.9)
Oil and gas integrated, exploration and production	(7.9)	(0.2)	(7.3)	0.0	0.0	(0.7)	(12.0)	(14.2)	(3.9)	(33.2)
Oil and gas drilling, equipment and services	(7.7)	(1.0)	(17.7)	0.0	0.0	0.0	(9.7)	(10.2)	(9.4)	(21.5)
Capital goods	(7.7)	(7.0)	(9.1)	(0.2)	0.0	(1.4)	(14.7)	(10.0)	(5.3)	(21.8)
Transportation leasing	(7.7)	(17.5)	(23.5)	(0.9)	0.0	0.0	(5.0)	(3.0)	(6.3)	(12.6)
Real estate investment trusts (REITs)	(7.4)				0.0	(11.7)	(8.8)	(11.5)	0.0	(12.1)
Commodity chemicals	(7.3)	(1.6)	(6.8)	0.0	(4.8)	(2.1)	(2.4)	(13.1)	(12.1)	(22.9)
Railroads and package express	(6.6)							(2.5)	(3.7)	(13.5)
Regulated utilities	(6.1)	0.0	0.0	0.0	0.0	0.0	0.0	(6.1)	(42.6)	(6.2)
Unregulated power and gas	(6.1)	0.0	0.0	0.0	0.0	0.0	0.0	(6.1)	(42.6)	(6.2)
Technology software and services	(5.9)	(17.8)	0.0	(2.3)	(11.9)	(9.0)	0.0	0.0	0.0	(11.8)
Forest and paper products	(5.6)	0.0	0.0	0.0	(2.6)	(8.8)	(16.1)	(9.3)	(2.5)	(11.4)
Consumer durables	(7.4)	(8.1)	(5.6)	0.0	(3.7)	(7.8)	(15.3)	(2.0)	(5.9)	(18.5)
Engineering and construction	(4.8)	(12.6)	(4.7)	(4.5)	0.0	0.0	0.0	(8.1)	(0.6)	(12.3)
Business and consumer services	(4.4)	0.0	(23.0)	0.0	0.0	(2.6)	(3.0)	0.0	(2.1)	(9.3)
Aerospace and defense	(4.4)	(4.1)	(4.5)	0.0	(15.3)	(0.4)	(2.9)	(8.2)	0.0	(4.0)

Table 6

Revenue PTT Declines (%) (cont.)										
Technology hardware and semiconductors	(4.4)	0.0	0.0	0.0	(1.0)	0.0	0.0	(1.5)	(19.4)	(17.6)
Specialty chemicals	(3.8)	0.0	0.0	0.0	0.0	(4.2)	(9.7)	(2.0)	(0.3)	(18.3)
Agribusiness and commodity foods	(3.7)	(10.8)	(5.1)	(6.9)	0.0	0.0	(3.3)	0.0	0.0	(6.7)
Containers and packaging	(3.5)	(0.4)	(1.2)	(1.9)	0.0	(1.7)	(20.2)	0.0	(1.1)	(5.0)
Telecommunications and cable	(3.0)						(0.9)	(0.6)	(5.6)	(5.0)
Environmental services	(2.3)				0.0	(1.5)	(0.9)	0.0	(6.9)	(4.5)
Leisure and sports	(1.6)	0.0	0.0	0.0	0.0	(3.1)	0.0	(2.8)	(0.8)	(7.3)
Branded nondurables	(1.1)	0.0	0.0	0.0	0.0	0.0	(1.4)	0.0	(4.4)	(3.8)
Health care equipment	(0.8)	(5.3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(1.5)
Media and entertainment	(0.6)	0.0	(0.4)	0.0	(1.8)	0.0	0.0	0.0	0.0	(3.3)
Retail and restaurants	(0.6)	(0.5)	0.0	0.0	0.0	(1.4)	0.0	0.0	0.0	(3.4)
Transportation infrastructure	(0.4)									(0.4)
Pharmaceuticals	(0.2)	0.0	0.0	0.0	0.0	0.0	(1.2)	0.0	0.0	(0.4)
Health care services	0.0				0.0	0.0	0.0	0.0	0.0	0.0

Note: Empty cells in the table refer to recessionary periods before sector data were available.

APPENDIX II

Technique used to establish the cyclical scoring ranges in table 2

38. To establish the cyclical scoring ranges in table 2, we used a statistical technique known as k-means clustering. This is a method of cluster analysis that partitions data observations into k clusters (referred to as groups or buckets), maximizing the distance between cluster means, and by which each observation belongs to the cluster with the nearest mean. In this case, k, the number of scoring groups, is six.
39. The criteria use the k-means clustering technique for both the historical sector revenue and EBITDA margin PTT data. However, because the EBITDA margin PTT assessments were positively skewed, a log transform methodology was first applied to control the influence of more extreme PTT assessments on the resulting ranges. A log transform was not applied to the revenue PTT data, which were much less skewed.

APPENDIX III

40. The public finance sectors and their associated industry corollaries are:
- Not-for-profit health systems, not-for-profit hospitals, and not-for-profit mental health: Health care services industry

- Airports, transit systems, toll roads, parking, and ports: Transportation infrastructure industry
- State housing finance agencies and public authorities, and senior living: REIT industry
- Solid waste: Environmental services industry
- Public power utilities, electric cooperative utilities, and water and sewer utilities: Regulated utilities industry

41. These criteria represent the specific application of fundamental principles that define credit risk and ratings opinions. Their use is determined by issuer- or issue-specific attributes as well as Standard & Poor's Ratings Services' assessment of the credit and, if applicable, structural risks for a given issuer or issue rating. Methodology and assumptions may change from time to time as a result of market and economic conditions, issuer- or issue-specific factors, or new empirical evidence that would affect our credit judgment.

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