

25 Years of Rated Infrastructure Corporates and Project Finance

Assessing why rated Infrastructure is displaying stronger credit quality and reduced risk



Key findings

Understanding Uncertainty. Investing in Intelligence. Embedding **Excellence.**

S&P Global Ratings' population of rated Infrastructure (Corporates and Project Finance, hereafter "Projects") credits has grown substantially over the years, while maintaining a comparably lower risk profile than counterparties principally involved in the production of goods, known as non-financial corporates (NFCs). By most measures, Infrastructure credits rated by S&P Global Ratings have shown comparably lower default rates, lower ratings volatility, and higher recovery prospects relative to the larger NFC universe. The relatively stronger credit risk performance is attributable to the stronger rating profile for this sector, but most of these conclusions generally hold true at comparable rating levels as well.

Key Findings:

- S&P Global Ratings' global Infrastructure credits portfolio has seen largely uninterrupted growth over the last 25 years. The majority of this sector that we rate is rated Investment Grade. We have, however, seen an increase in Speculative Investment Grade credits in the past decade.
- Default rates were highest for Infrastructure during the 1990-91 U.S. recession period, and again during the 2000-2002 span. The first was a broad contraction across most industries while the second was largely due to the liberalization of the U.S. Power sector in the early 2000s. In the last period of high default rates 2008-2012, Infrastructure defaulted notably lower (peak default rate 1%) than NFCs (peak default rate 6%).
- Over the long term, Infrastructure credits show a lower likelihood of default and a higher relative level of rating stability than the broader population of NFCs. For the 'BBB' category, over the 10-year period from 2006 to 2016, the cumulative default rate for Infrastructure Corporates and Projects was 1.83% versus 3.45% for NFCs.
- Recoveries are higher for Infrastructure (Corporates plus Projects) than NFCs, largely due to the higher portion of secured debt in Infrastructure (for Projects, in particular). 52% of Infrastructure instruments have recoveries of 80% or higher, compared to 39% for NFCs.
- Infrastructure credits show a higher level of rating stability (defined as net change in credit quality) than the broader population of NFCs over the long term.

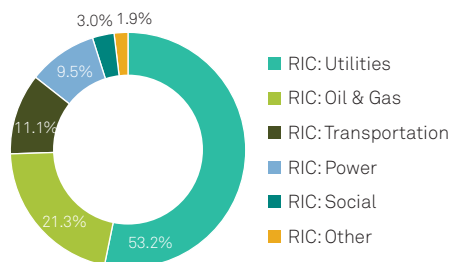
Project Finance versus Infrastructure Corporates

Our Infrastructure database comprises 1,105 ratings of Infrastructure Corporates (77%) and 335 Infrastructure Project Finance (23%) ratings as of 31 December 2016, segmented by region and sector .

Utilities dominate the Infrastructure Corporates population

The North American Power and Utilities Sectors supported the development of Infrastructure as an Asset Class and still have the largest share of our Infrastructure Corporates database (Oil & Gas, Power and Utilities together represent 84% of total Infrastructure Corporate issues).

2016 Corporate Infrastructure Sector Contributions

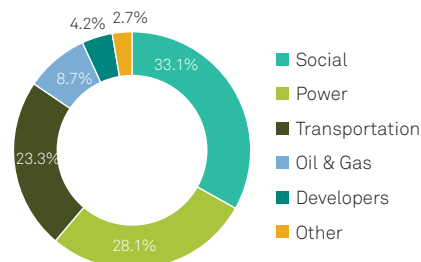


*Percentages based on population of rated issues.
 ** RIC - Rated Infrastructure Corporates.
 Source: S&P Global Fixed Income Research.

Project Finance includes Social Infrastructure ratings

Infrastructure Project Finance became a significant share of the rated Infrastructure population around the turn of the century, originally in the U.S., U.K., Canadian and Australian markets. Since then, its growth has continued in all regions.

2016 Infrastructure Projects' Sector Contributions



*Percentages based on population of rated issues.
 Source: S&P Global Fixed Income Research.

The Infrastructure sector is overwhelmingly Investment Grade

About 66% of active credits at the end of 2016 were rated Investment Grade. About 68% of Infrastructure Corporates and 60% of Project Finance ratings were rated Investment Grade at the end of 2016.

89% of Utilities and 84% of Social Infrastructure credits were rated Investment Grade at the end of 2016, compared to only 40% of Power and 54% of Oil and Gas (mostly midstream assets). 75% of Infrastructure credits were Investment Grade at the end of 2016, down from 80% 10 years earlier.

By region, over 80% of rated credits were Investment Grade in Europe, Asia Pacific and Canada at the end of 2016. In the U.S., Latin America and the Middle East, the Investment Grade population at the end of 2016 was below 70%.

Infrastructure rating distribution at year-end 2016 (by sector)

| | Utilities | Oil and Gas | Transportation | Power | Social Infrastructure | Other |
|-------|-----------|-------------|----------------|-------|-----------------------|-------|
| AAA | 0% | 0% | 4% | 1.5% | 0% | 6.7% |
| AA | 4.4% | 0% | 8% | 0.5% | 6.9% | 6.7% |
| A | 39.8% | 9.5% | 19.4% | 7% | 39.6% | 13.3% |
| BBB | 46.6% | 44.3% | 46.8% | 37.2% | 38.9% | 43.3% |
| BB | 7.3% | 25.8% | 13.4% | 28.1% | 12.5% | 23.3% |
| B | 0.7% | 17% | 7% | 21.6% | 2.1% | 6.7% |
| CCC/C | 1.2% | 3.4% | 1.5% | 4% | 0% | 0% |
| Total | 100% | 100% | 100% | 100% | 100% | 100% |

Source: S&P Global Fixed Income Research.

Despite periods of flat growth, for 25 years Infrastructure lending has trended upward, for both Project Finance and Corporates

S&P Global Ratings' rated Corporate and Project Finance infrastructure population grew by over 300% to 1,440 issues at the end of 2016 from 355 at the start of 1991. Over 74% of active 2016 infrastructure credits were rated investment grade ('BBB-' or higher), down from 80% 10 years earlier.

About 77% of Infrastructure Corporate Ratings and 67% of project finance ratings were investment grade at the end of 2016, compared with only 40% of NFC ratings.

The number of speculative rated credits increased in periods of credit stress (such as economic downturns). The change may also reflect increased investor acceptance of different asset types, geographies and/or leverage levels as project financing became a more prevalent financing tool and the North American sub-investment grade financing market developed.

Growth by region and sector

North America represented 53% of total credits by the end of 2016, down from 96% in 1991. In the same period, the total credits in EMEA grew from 3% to 28%. In 1991, Latin America had only one issue in our database; it now has 128 issues (3% of the total).

These changes reflect the growth in capital markets and in Infrastructure as an asset class globally. They also reflect the growth in Speculative Investment Grade financing in the U.S. Energy sector.

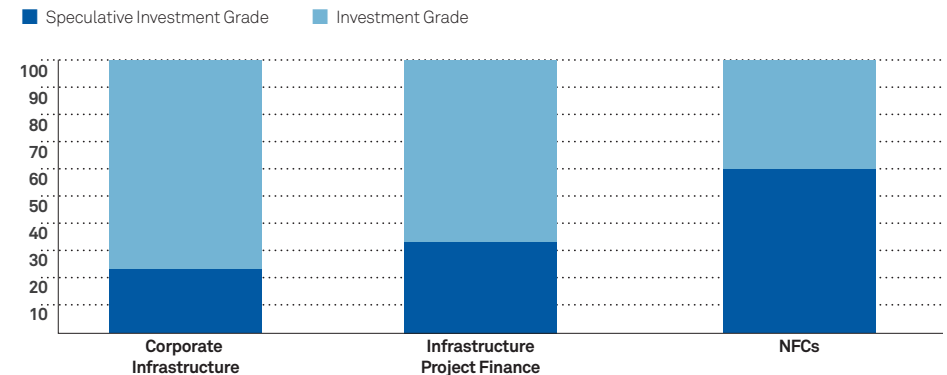
Infrastructure exhibits higher level of Investment Grade ratings than NFCs

Infrastructure Corporates and Project Finance ratings exhibit a comparatively higher percentage of Investment Grade than NFCs.

For Infrastructure Corporates, the high weighting of the regulated utilities and associated infrastructure characteristics (essential services, high barriers to entry, regulated, limited ability to add debt asset backing) are generally supportive of better credit quality.

Infrastructure Project Finance credits, despite having higher levels of leverage than their Corporate peers, also exhibit high levels of Investment Grade (relative to its size). This is largely attributable to the protections inherent to the project financing scheme, such as the security package, structural elements including off take agreements, hedging, reserve accounts, distribution traps, legal separateness, as well as limitations on new debt and asset sales.

2016 year-end rating distributions



Source: S&P Global Fixed Income Research.

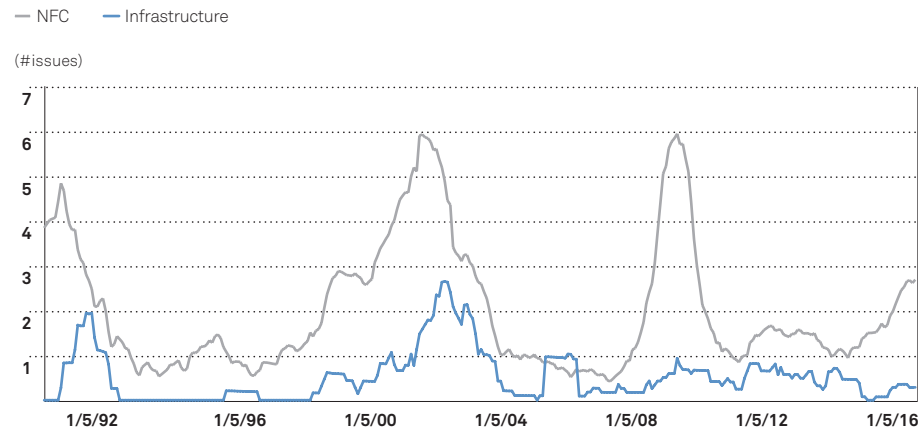
Default rate trends and analysis

Historical cycles: Infrastructure dodges the financial crisis

In general, Infrastructure did see relative peak default rates in line with those of NFCs associated with the 1989-1991 U.S. recession, and again during the 2000 recession.

This sector did, however, generally make it through the global financial crisis relatively unscathed with a peak default rate under 1%, compared to just under 6% for NFCs.

Trailing 12-month default rates



Source: S&P Global Fixed Income Research

On a trailing 12-month basis, the overall infrastructure default rate was higher than that of NFCs only during December 2005 through November 2006, as a result of the bankruptcy filing of Calpine Corp. in December 2005, which included nine defaulting instruments in our data set.

Relative lower default risk for Infrastructure Corporates than Infrastructure Projects

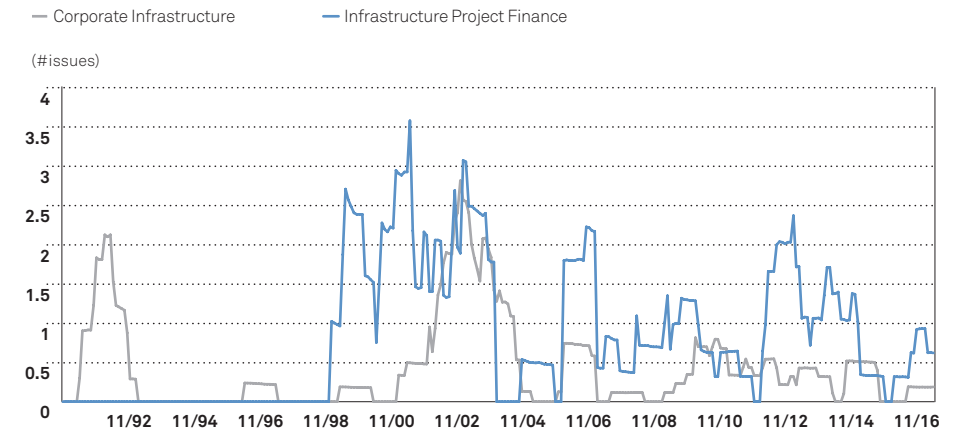
Overall Infrastructure Project Finance default rates compared with the equivalent Infrastructure Corporates are higher.

For the period 1991-2016, we recorded a peak default rate for Infrastructure Project Finance in 2001 of 3.6% and a peak default rate for Infrastructure Corporates in November 2002 of 2.8%.

Excluding some high risk sectors, such as Merchant Power (corporate defaults of which peaked in 2002), the peak default rate of Infrastructure Corporates drops would have been 1.5%.

The more meaningful difference between Infrastructure Corporates and Infrastructure Project Finance is also evident when comparing the cumulative 1991-2016 default rate of 2.5% versus 9.4%, respectively (see page 7).

Infrastructure Corporate and Project Finance trailing 12-month default rates (by sector)



Source: S&P Global Fixed Income Research

The U.S. leads incidence of defaults relative to Infrastructure ratings, generally

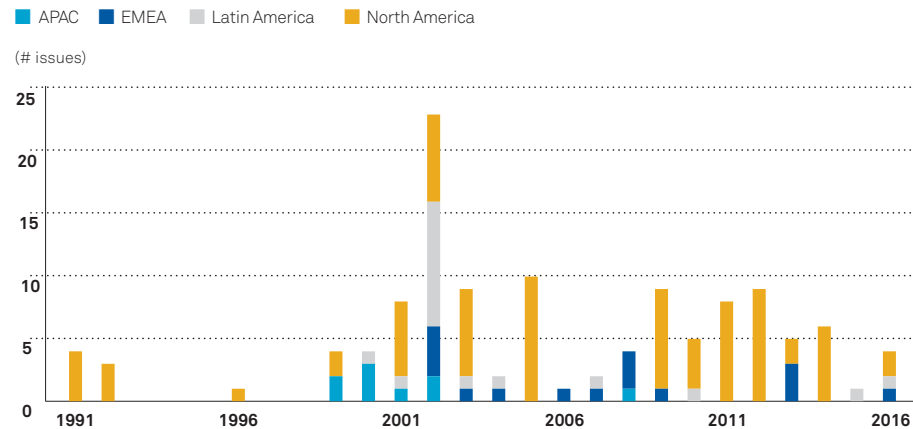
The U.S. leads with the largest incidence of defaults, though this is not always the case on a year-to-year basis. While North America accounts for nearly 65% of all defaults in the 1991-2016 period, it also accounted for 53% of total credits by end 2016 (from 96% in 1991).

The only other outlier to a noticeable margin is Argentina, with 8% of all defaults in the 1991-2016 period but less than 1% of all ratings as at the end of 2016.

On the positive side, Canada had 9% of ratings as at the end of 2016 but just 2% of defaults in the 1991-2016 period.

The U.K. had 12% of ratings and 8% percent of defaults in the 1991-2016 period.

Annual infrastructure defaults by region



Source: S&P Global Fixed Income Research.

Power leads incidence of defaults relative to Infrastructure ratings, generally

The Power sector accounted for 55.7% of all defaults in the 1991-2016 period followed by the Utilities sector, which accounted for 13.1% of all infrastructure (corporates and project finance) defaults.

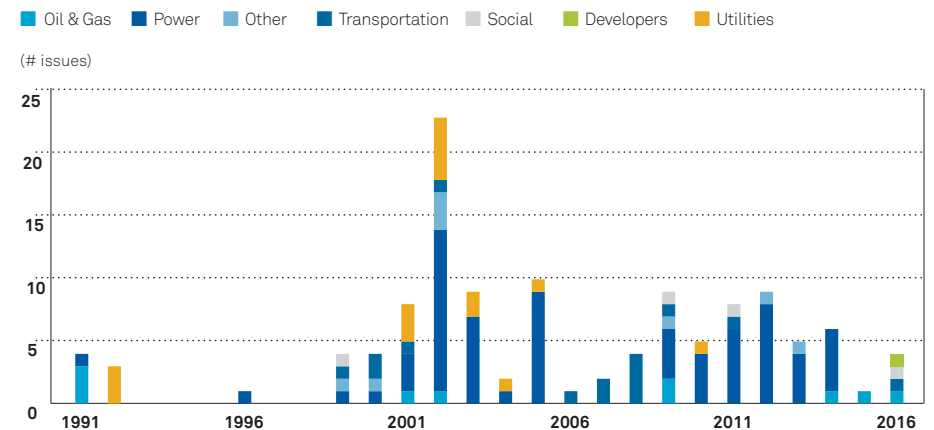
The Power sector's performance shows relatively higher market risk, such as low barriers to entry, merchant pricing risk, less regulatory protection, aggressive leverage, lower than forecasted demand, which is reflected in lower rating levels.

Similar market risk factors, including lower than forecasted demand and aggressive leverage, as well as construction delays led to higher historical default rates in the transportation sector, with several Project Finance roads defaulting in Australia and EMEA in the 2006-2008 period.

The Social Infrastructure sector, on the other hand, accounted for only 3.3% of total defaults for Infrastructure Corporates and Project Finance for the 25 years period.

The higher default rates for U.S. Infrastructure instruments are partly explained by the higher levels of Speculative Investment Grade credits. Over the past 25 years, the proportion of Speculative Investment Grade Infrastructure credits in the U.S. has steadily increased – from just 10% in 1991, to 25% in 2006. By 2019, this figure is expected to reach 33%.

Annual Infrastructure defaults by sector



Source: S&P Global Fixed Income Research.

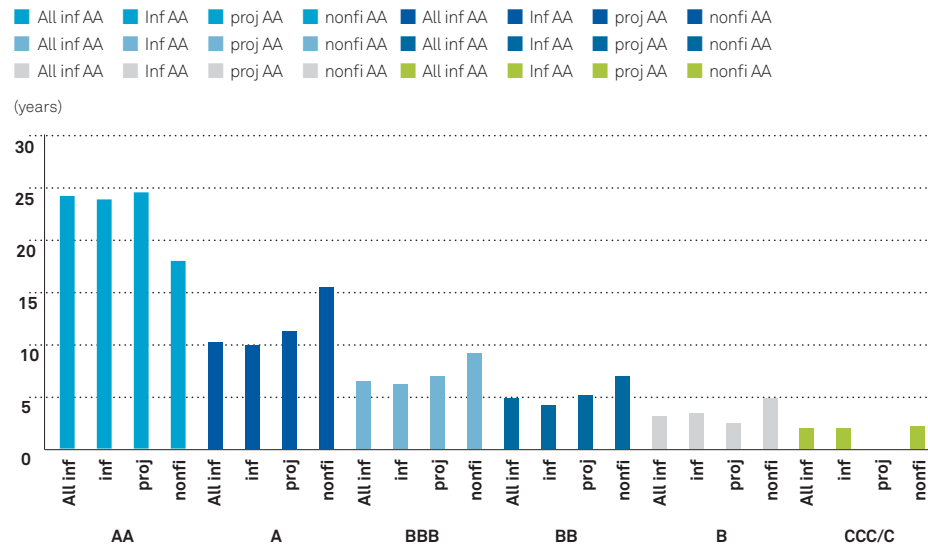
Infrastructure initial rating and time to default

Generally, there is a positive correlation between initial ratings and time to default, if they occur. This holds true within each asset class examined here, but some key difference across asset classes exist.

Though some sectors have only very few incidents of default, we see from the average time to default from original rating (when categorized by sector) that the average time is just over six years for those projects that defaulted between 1991 and 2016.

The notable exception is the Oil & Gas sector, with a much longer average time to default. However, there are only three defaults from this sector, so the influence of outliers is more pronounced. In this case, one of the defaults occurred roughly 2.5 years after receiving its initial rating, while the other took 16.7 years. In terms of Infrastructure Corporates versus Infrastructure Project Finance overall, the averages were very close (6 years and 6.2 years, respectively).

Average Time to Default from Original Rating



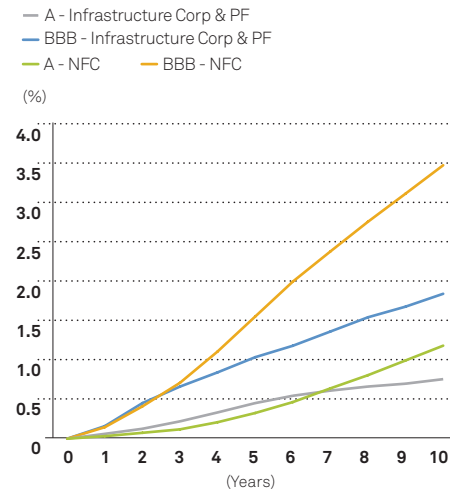
Source: S&P Global Fixed Income Research.

Relative default risk of Infrastructure Corporate and Project Finance is generally lower than NFCs

Comparing cumulative default rates for Infrastructure Corporates and Project Finance versus NFCs, we observe higher levels of cumulative defaults for NFCs. For example, the BBB 10-Year cumulative default rate for Infrastructure Corporates and Project Finance was 1.83% versus 3.45% for NFCs in the 2006-2016 period.

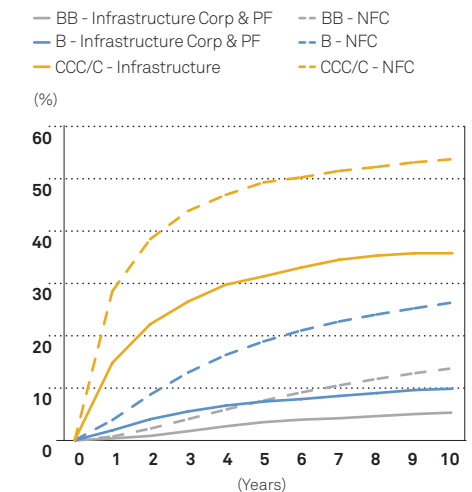
Cumulative default rates of Infrastructure (Corporates plus Projects) versus NFCs

Investment Grade cumulative default rates



Source: S&P Global Fixed Income Research.

Speculative Grade cumulative default rates



The cumulative default rate for Infrastructure Corporates for the 1991-2016 period was 2.5%. For the same period, the Infrastructure Project Finance cumulative default rate was 9.4%.

The Speculative Investment Grade cumulative default rate for Corporate Infrastructure ratings was 7.1% for the 1991-2016 period. For Infrastructure Projects, the Speculative Investment Grade cumulative default rate for the 25 years period was 20.4%.

Infrastructure (Corporates, in particular) exhibits comparably muted ratings volatility relative to NFCs

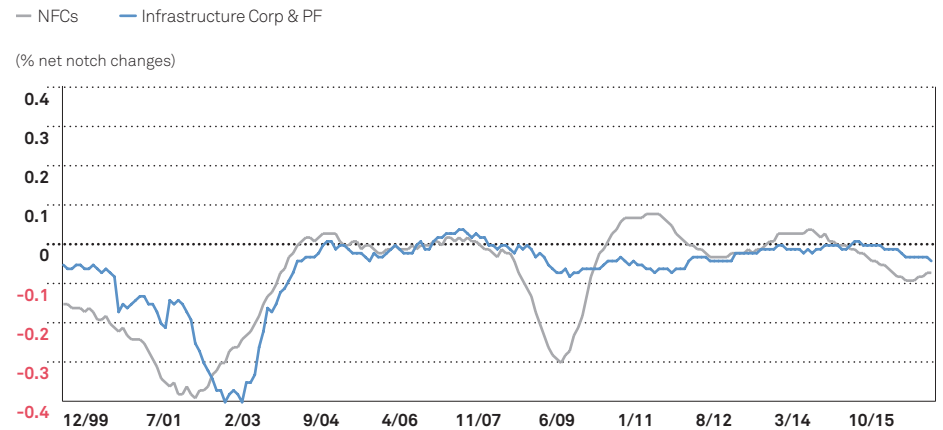
Losses on investment can occur even without a default as ratings transitions to lower credit quality may lead to other implications for investors restricted from holding Speculative Investment Grade debt or leading to non-compliance with a target ratings distribution for a portfolio, for example.

When we measure the net rating changes (upgrades minus downgrades) as a percentage of the total issue/issuer base over a 12-month period, both Infrastructure and the broader NFC universe display credit quality changes in line with the economic cycles. That said, rated infrastructure credits generally display a stronger track record of rating stability than NFCs.

Infrastructure saw its largest rate of credit degradation during the 2001-2003 period, which coincides with its peak default cycle and significant regulatory changes in the U.S. energy sector. In terms of net rating changes, this cycle peaked slightly later than that of NFCs. Some of this is a product of the asset class characteristics, where, for example, Project Finance transactions typically have dedicated debt service reserves and distribution traps creating a delayed effect in times of broad or sustained economic stress.

Another key explanatory reason for this delay is the stronger rating distribution relative to NFCs. Once again – much like defaults – downgrades within Infrastructure were fewer in number and lesser in severity during the financial crisis relative to NFCs. More recently, infrastructure has seen fewer relative downgrades even despite the stress faced by the Oil & Gas sector. However, because of the delay in rating changes relative to NFCs, Infrastructure may yet see residual downgrades through 2017.

Trailing 12-month net change in credit quality



*Represents upgrades minus downgrades over a trailing 12-month period as a percentage of the rated population

The stronger credit profile and presence of the Utilities sector are key drivers of stability of ratings for Infrastructure

The periods of highest ratings volatility for infrastructure ratings are during periods of stress in the Utilities, Power and Oil & Gas sectors, most notably as a result of the energy deregulation period of 2001-2003 in the U.S., and more recently, in the Oil & Gas sector since mid-2014. Though it has not led to defaults (rather transitions) there has been a significant structural change in Europe following liberalization, too.

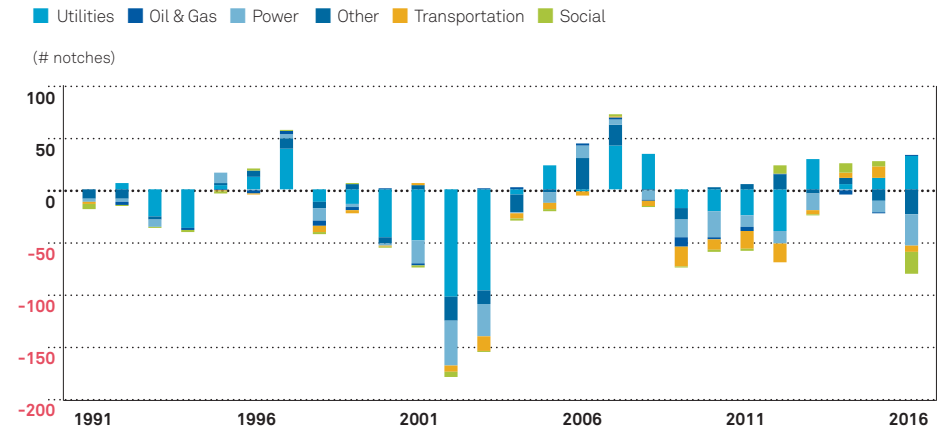
The sheer size of the rated Utilities universe means that it has an outsized impact on overall volatility than other sectors. In respect of upgrades versus downgrades, Utilities are more stable compared to the Power and Oil & Gas sectors given the more regulated nature of the sector, especially since the performance problems of the 2001-2003 period.

Following five years of continuous positive net changes (upgrades outnumbering downgrades), 2009-2012 was a period of net downgrades across the rated infrastructure universe, largely due to the financial crisis. After a period of improving credit quality, 2016 was again a year where downgrades outnumbered upgrades by a significant margin. This was most notable in the Power and Oil & Gas sectors and the Social Infrastructure.

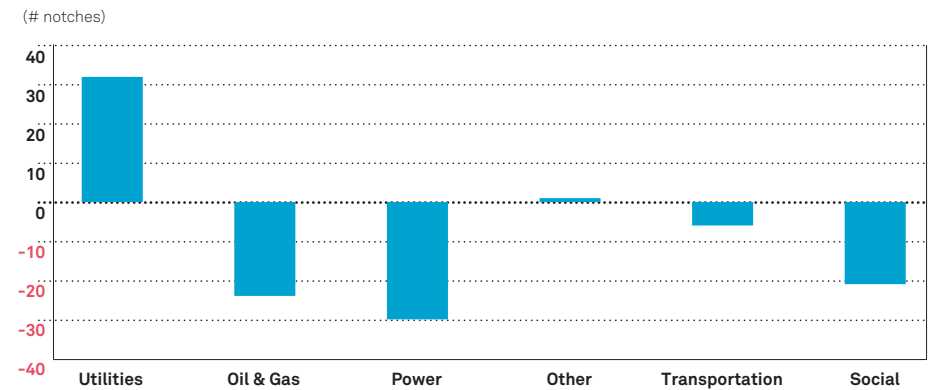
For Oil & Gas, sustained falling commodity prices affected the cash flow generation capacity of a variety of projects. This sector has undergone significant stress since mid-2014, accounting for over half of all corporate defaults in 2016. The peak stress for this sector appears over as commodity prices have generally stabilized, though some residual stress remains. The sector still represented the largest share of NFC defaults in 2017, at roughly 28%.

The Power sector was also negatively impacted as merchant energy producers, especially older baseload coal plants, faced falling electricity prices brought on by the increase in more efficient gas-fired plants taking advantage of America's shale gas boom. Renewable penetration also played a role as countries around the world increased the proportion of green energy sources to meet emission reduction targets.

Annual net rating actions (by sector)



2016 Infrastructure Corporate and Project Finance net rating actions (by sector)



Recovery rate trends and analysis

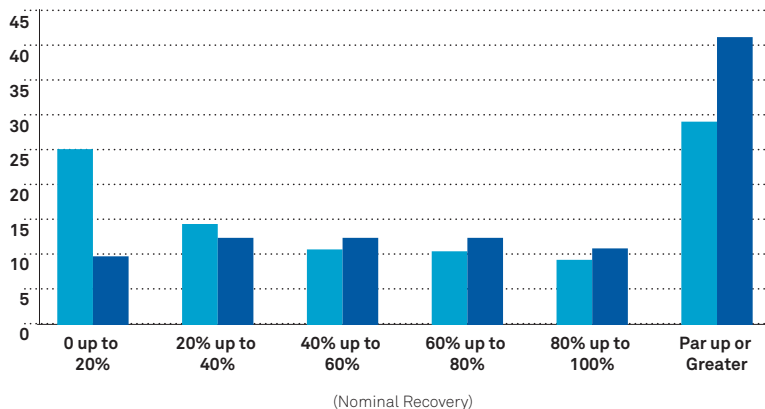
Recovery performance for infrastructure overall has historically been stronger than that of NFCs. Asset quality and low industry risk, particularly among regulated utilities, have contributed to the elevated recovery values for defaulted infrastructure debt instruments.

- Overall, 41.4% of defaulted infrastructure debt instruments recovered par or greater, compared with 29.3% of that from NFCs.
- Elevated recoveries have been even more pronounced among regulated utilities, where 51.6% of the defaulted debt instruments recovered par or greater.
- At the low end of the distribution, just 10% of defaulted infrastructure debt instruments recovered 20% or less, compared with nearly 25% of NFCs overall.

Distribution of recovery rates (by instrument)

■ NFCs ■ Infrastructure Corporate and Project Finance

(% of defaulted instruments)



Distribution of issue-level recovery rates (by Infrastructure sector)

| Distribution of recovery rates | Infrastructure total | RIP - total | RIC - total | Power | Transport | Oil & Gas | Utility | Other |
|--------------------------------|----------------------|-------------|-------------|-------|-----------|-----------|---------|-------|
| Par or Greater | 109 | 11 | 98 | 51 | 2 | 6 | 50 | 0 |
| 80% up to 100% | 29 | 5 | 24 | 3 | 2 | 1 | 23 | 0 |
| 60% up to 80% | 33 | 11 | 22 | 10 | 5 | 5 | 13 | 0 |
| 40% up to 60% | 33 | 6 | 27 | 20 | 1 | 4 | 8 | 0 |
| 20% up to 40% | 33 | 1 | 32 | 32 | 0 | 0 | 0 | 1 |
| 0 up to 20% | 26 | 12 | 14 | 16 | 1 | 4 | 3 | 2 |
| Grand Total | 263 | 46 | 217 | 132 | 11 | 20 | 97 | 3 |

Nominal recovery for bank debt and bonds that defaulted from infrastructure companies and projects. Sources: S&P LossStats and S&P Global Fixed Income Research

Reasons why regulated utilities tend to have higher recoveries than NFCs include:

- Essential assets and services providing power, water, gas
- Little or no practical substitute, with a business model shielded by regulation
- The ability to add debt is often limited by regulation or secured bond

As a result, the Utilities sector has a “very low” industry risk score (the only corporate sector to have this assessment).

Projects that also experience higher recoveries, also tend to benefit from having similar characteristics as regulated utilities, including:

- Essential assets
- The ability to add debt is often limited by covenants and debt is predominately secured
- Low industry risk and stable cash flows, supported by long-term offtake contracts such as power purchase agreements or availability based payments under a concession, O&M contracts, fuel supply contracts etc.

In contrast, the projects with the lowest recoveries typically exhibited relatively high market risk or encountered technology issues. For example:

- **AES Eastern Energy, L.P.** - recovered under 10% following its 2011 default, as it faced lower power prices and increased costs for coal and air pollution controls
- **Northeast Biofuels, L.P.** - recovered near 14% following its bankruptcy in 2009 after design problems crimped ethanol production

Definitions

Infrastructure investment is broadly defined as being investment exposure (debt or equity) to real assets vital to a country's economic development and prosperity that provide essential services for the orderly operations of an economy, such as real assets with national, regional, or local importance, and essential nature of facilitating movement of people, goods, or commodities. Such as transportation networks, health and education facilities, communication networks, water and energy distribution systems. Key risks are in design, permitting, construction, operations, volume, and maintenance with debt repaid predominately by cash generated from the assets themselves.

Characteristics vary, as the range of risks managed by Infrastructure investments is broad (greenfield /brownfield, contracted/regulated/merchant, availability/demand risk). Characteristics sought by investors in infrastructure include, amongst others, longevity, strong competitive advantage, high barriers to entry and monopolistic characteristics, low volatility, volatility, inflation linked or predictable cash flows.

For the purpose of this study, our definition of infrastructure does not include USPF (U.S. Public Financed) rated infrastructure assets.

Infrastructure sectors covered

Utilities: Water, sewerage, gas and electric businesses including regulated.

Oil & Gas: Midstream companies that derive the majority of the revenues from transporting, processing, storage and marketing of commodities (such as natural gas and oil).

Social: Education, accommodation and entertainment assets such as sports facilities, hospitals, prisons or public housing.

Power: Companies with a major contribution from unregulated/merchant generation or retail/service activities.

Transportation: Commercial operations of airports, marine ports, toll road networks, railways and other transportation infrastructure assets.

Other: Other infrastructure like assets not included in any of the above sectors such as mining, telecom networks, desalinization plants or industrial projects.

Developers: We define a project developer (or a "developer") as a corporate entity, typically structured as a holding company that owns, develops, and operates assets mainly in the energy and infrastructure sectors.

Default: We deem 'D' (default), 'SD' (selective default), and 'R' issuer ratings to be defaults for the purposes of this report. A default is assumed to take place on the earliest of:

The date S&P Global Ratings revised the rating(s) to 'D', 'SD', or 'R';

The date a debt payment was missed;

The date a distressed exchange offer was announced; or

The date the debtor filed for, or was forced into, bankruptcy.

S&P Global Ratings lowers its rating on an obligor to 'D' or 'SD' if the obligor is conducting a distressed exchange offer. 'R' (regulatory intervention) indicates that an obligor is under regulatory supervision owing to its financial condition.

This does not necessarily indicate a default event, but during the period of regulatory supervision, the regulators may have the power to favor one class of obligations over others or pay some obligations and not others.

Average cumulative default rate: Cumulative default rates average the experience of all calendar years (static pools) by first calculating marginal default rates for each possible time horizon and for each static pool, weight-averaging the marginal default rates conditional on survival (survivors being nondefaulters), and accumulating the average conditional marginal default rates. We calculated conditional default rates by dividing the number of issuers in a static pool that default at a specific time horizon by the number of issuers that survived (did not default) to that point in time. Weights are based on the number of issuers in each static pool. Cumulative default rates are one minus the product of the proportion of survivors (nondefaulters).

Average change in credit quality: The average number of rating notches by which ratings changed during the stated time frame, where we take the average across all ratings in the set under consideration (e.g., a particular region or sector). In this averaging, we count downgrades as a negative number of notches, whereas we count upgrades as a positive number. We consider stable ratings to have undergone a transition of zero notches. We believe this measure acts as a useful summary of the credit performance of, for example, a given sector, since it combines the relative number of ratings undergoing transition with the severity of that transition.

Recovery - Recovery values are based upon the ultimate recovery rates, at emergence, of defaulted debt instruments (including bank debt, bonds, and notes) from issuers that defaulted through bankruptcy filings, distressed exchanges, or non bankruptcy restructurings. The sample of Infrastructure Corporate and Project Finance recoveries are based on a sample of 263 defaulted instruments from 42 infrastructure companies and 23 projects that defaulted and emerged from default between 1988 and 2016. Non Financial Corporate recoveries are based on a sample of 4,072 defaulted instruments from U.S. companies.

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