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**Transparency in Project Bond Ratings - Assessment of Rating Methodologies
and Development of a Proven Rating Simulator**

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Topic of the work project:

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Executive summary

The EU promotes the use of project bonds to develop a solid source for funding infrastructure projects. During an internship with the financial advisory team at UniCredit, the project finance rating methodologies of the major rating agencies were analyzed and a rating simulator was built to gain insights into the main rating drivers. The resulting rating simulator is not able to fully forecast a rating but provides guidance for structuring future projects. After analyzing two case studies, it appears that S&P uses the most comprehensive, Moody's the most transparent and Fitch the most flexible methodology to rate project finance bonds.

Key words

Project finance; project bonds; rating; infrastructure investments

1 Purpose and structure of the working project

The purpose of this work project (WP) is to bring transparency to the rating process of project bonds by (1) deriving the major rating drivers and by (2) assessing the characteristics of the agencies' rating methodologies. The first part of the WP was to gain an understanding of the rating criteria of the major rating agencies, Moody's, Fitch and Standard and Poor's. The second part involved the development of a rating simulation tool in order to determine the main drivers of a credit rating. An additional goal was to design the tool in a way that it could be helpful to the financial advisors of UniCredit to decide on the structuring of future projects using bond solutions. In a third and final part, two case studies of existing projects have been analyzed in order to characterize the different rating approaches. Note hereby that the work project is focused on the rating methodology for project debt of private public partnership (PPP) infrastructure projects with availability-based revenue schemes.

1.1 Characteristics of a project finance

Project finance is a method to finance large-scale projects, where the project's net cash flow is the single or primary source of loan repayment, while the project's assets serve as collateral for the typically non-recourse loan (Akbiyikly, 2006). This work project focuses on availability-based infrastructure projects, which are typical private public partnership (PPP) projects where the private concessionaire provides public infrastructure but does not bear usage or volume risk. A PPP project typically includes a construction obligation and a long-term (20 – 30 years) concession, obligating the project company to design, build, maintain and / or operate the infrastructure for the whole duration of the concession before passing the ownership of the project's assets back to the government. Availability-based refers to the revenue mechanism of the

project. In contrast to a toll-based model, availability projects are not exposed to large parts of public service market risk (volume and price) but receive a fixed payment from the public concedent (i.e. a government) according to the availability of the project (degree of operations). The absence of output market risks in these projects provides a good low-risk basis for bond solutions due to stable expected project cash flows. In social infrastructure projects - for example hospitals, educational facilities or state penitentiaries - availability-based payment schemes seem natural since the utilization of the asset is not linked to an underlying market at all or only to a small degree. The revenue generation of road projects, however, is highly dependent on traffic (through tolls and/or fuel tax revenue) and availability payments do not seem to constitute the best choice since the public partner has to bear the traffic risk. (Gatti, 2013) A financially weak government may run into problems funding the difference between availability payments to the project and any toll and tax revenue generated, thus exposing the project concessionaire and its creditors to increased sovereign counterparty risk. Therefore it is important to note that a bad project with weak or uncertain underlying revenue generation cannot be fundamentally improved by sovereign guarantees unless the government has a stable and durable source of income (e.g. oil)¹.

1.2 Current state of the infrastructure project bond market in Europe

Years of declining public spending on infrastructure have impaired the existing infrastructure in some EU countries. In the Europe 2020 goals, the EU manifested its target of developing a smart, upgraded and interconnected infrastructure in order to foster an internal market among EU member states. This is an ambitious target since estimates point to investment needs of EUR 1,500bn to EUR 2,00bn in transportation,

¹ Suggested by tutor Mariana Abrantes des Sousa during the third meeting on 15th of November 2013

energy, information and communication networks through 2020 (European Commission, 2011).

Due to the governments increased indebtedness followed by strong austerity measures the states are limited in their ability and willingness to finance large infrastructure projects. At the same time, private banks are facing new regulatory frameworks with the aim of increasing financial stability in the sector. This has caused banks to increase their equity ratio while limiting long-term loans, which are typical for infrastructure funding. In light of the enormous funding needs, the “Europe 2020 Project Bond Initiative” has the purpose of facilitating and stimulating a bond market for infrastructure investments in Europe. In this way, the EU is trying to encourage institutional investors to allocate their funds to infrastructure projects and to partially solve the funding mismatch.

Project bonds have been used in North America since the 1980s, whereas in Europe this instrument was hardly present. The EIB Project Bond 2020 Initiative started its pilot phase in 2012, with the aim of stimulating the bond market for infrastructure projects by providing credit enhancements. Most institutional investors face the regulatory threshold to only invest in bonds rated as investment grade. These credit enhancements improve the bonds’ risk profiles allowing rating agencies to rate bonds along this category (Gatti, 2012). Currently, project bond volumes in Europe have recovered. After years of low bond issuance volumes, Europe’s new bond issues in the infrastructure sector jumped from EUR 128mn in 2012 to EUR 3,094mn in 2013². Although this is still 26% below 2006 volumes, it shows a strong recovery compared to

² Including all PFI/PPP related bonds in sectors: Airports, bridges, education, government buildings, hospitals, ports, prisons, rail, residential buildings, roads, tunnels, other infrastructure; Source: Dealogic

the previous years and may mark the creation of a sustainable funding source for project finance.

1.3 Importance of a rating for project bonds

Project finance is a complex field and requires a high level of knowledge. Long-term non-recourse project finance is an especially complex type of financing, whether the creditors are commercial banks (intermediators) or dis-intermediated long-term investors. Thus, it always requires a higher level of credit risk analysis and underwriting skills and methodologies than other types of investment instruments such as sovereign bonds or corporate bonds. According to Casserly (1994, pp. 125) “[...] *the existence of significant risks in a market often represents an opportunity for those who clearly understand the risks and can charge good prices for absorbing or intermediating them.*”. He proposes to use the “insider strategy” to assess the risk in a unique and complex credit transaction. With this strategy, the assessing party has to go as close as possible to the risk and build experience and contacts in the market. Therefore, entering the market as an inexperienced investor is not easy. Rating agencies however, can provide valuable information and assessments useable for new investors.

By using credit ratings, the investor outsources part of due diligence work. Thus, assuming all credit ratings are standardized, an agency’s opinion always acts as an initial investment filter, where investors choose projects suited to their risk preference. In addition, the credit rating report provides a good opportunity to cross-check the internal assessment – much like the widespread 4-eye-principle. Professional investors familiar with the industry will consider credit ratings only as a second source to their own assessment.

Additionally, the rating of a project bond does influence its pricing and therefore the financing cost of the project. Knowing the determinants of a rating is therefore of significant importance for a financial advisor in order to structure the deal in the best and most cost-efficient way (Gatti, 2012).

2 Rating methodology analysis

In the following paragraph, the project finance rating methodology of each rating agency will be described and subsequently assessed in point 2.4.

2.1 Moody's rating methodology

Moody's has two separate methodologies - one covering construction phase risk, one covering the operation phase risk. In both, the rating represents an estimation of the bond's expected loss³ rather than the probability of default. Moody's argues that in this way, the rating indicates both, the probability of default and the severity of this potential default event (Moody's, 1999). If during construction, construction and operation phase methodology would yield a different rating, Moody's will always take the lower of both ratings.

In an interview, a Managing Director of Moody's confirmed that the agency is in the process of revising both its methodologies established in 2007 to include recent developments in the market, such as the European Project Bond Initiative 2020. In addition, it is an approach to follow the regulatory pressure⁴ to offer more transparency in the rating process. In conjunction with this renewal, the stochastic approach is set to be replaced by a qualitative scoring model.

³ Expected loss = Probability of default * Loss given default

⁴ e.g. supervision of credit rating agencies through the European Securities and Markets Authority

2.1.1 Construction-phase risk assessment

Moody's construction-phase risk assessment is split into a stochastic and a qualitative part. The stochastic part is used to model the rare construction risk inherent in the project while considering all existing risk-mitigation packages. The construction raw risk is then adjusted by a qualitative scoring system reflecting contractual, funding and external risk factors.

In the beginning, the methodology proposes to categorize the complexity and type of the project. The combination of these two factors provides the base mean loss and standard deviation of the project (e.g. Standard civil project: Mean loss = 10.9% Loss standard deviation = 11.5%⁵)⁶. In addition, the agency also provides an assumption for the additional loss in the case of a construction contractor default relating to the delay caused and potentially higher fees for finding a suitable replacement (e.g. Standard civil project: Effect of contractor default = 12.0%). The magnitude of this expense increases with the complexity of the project since bargaining power lies with the low number of construction companies capable of finishing the construction obligation.

In order to lessen this substantial risk stemming from the project's mean loss and the potential default of the construction company, the project structure usually provides mitigations. Typically, these are in the form of a contractor support (liability caps), which are usually backed by third parties. Moody's model assumes that if a contractor goes into default, the liability cap is only claimable to the guaranteed amount. Therefore, to include the guarantees' certainty, the underlying supporting entity's probability of default as well as the properties of these guarantees also have to be taken

⁵ Corresponding to the contract value of the project

⁶ These numbers are based on Moody's experience with existing PPP ratings, an internal survey of Moody's project finance analysts globally and discussions with contractors in various jurisdictions.

into consideration. UK-based adjudication bonds, for example, undergo a haircut to their nominal value due to their contractual terms, the analysis of claims paying history and the laws in the relevant jurisdiction. The probability of default of these instruments is assessed via Moody's credit rating of the issuing entity.

Moody's stochastic approach regards a project finance as a Collateralized Debt Obligation (CDO) – a combination of financial assets (Construction obligation, contractor support, financial / performance support packages), backing a financial liability (project bond (senior debt)). The model proposes to run a Monte Carlo Simulation where an asset's default and recovery follows a specific probability distribution. With each run, the model considers a certain combination of asset defaults and recoveries. The expected loss is then calculated by taking the average of all combinations' outcomes⁷. This approach allows the analyst to assume different probability distributions and correlations for the various assets of the project.

The previously established expected loss can be offset by capital contributions (CCs) by the government. A CC can be either milestone payments, paid progressively during the construction phase, or Substantial Completion Payments (SCP), a large lump sum payable after construction, commonly to ease the construction funding. The agency claims that CCs generally have an adverse effect on the project's expected loss. Since CCs decrease the amount that has to be funded by private sources, the loss given default⁸ (LGD) increases. In addition, if the debt volume is lower, it is likely that a smaller amount of equity is injected in the project to keep the debt / equity ratio constant. Less equity lowers the security buffer to cover potential losses resulting from cost or schedule overruns, thus increasing the probability of default (PD). Combining

⁷ Usually, 10,000 runs are undertaken

⁸ Loss given default = (1- Recovery rate)

both, the increased LGD and increased PD, the expected loss increases and the rating worsens.

In order to adjust this rating for additional factors, nine qualitative assessments are notching the rating up or down (maximal impact +/- 2 notches) to form a final construction-phase rating. Both factors regarding the funding and contractual structure and counterparty risks and external factors are taken into account. A Moody's analyst confirmed however, that the rating-analyst and rating-committee are able to add or remove factors where applicable on a case-by-case basis. An example would be a subcontractor providing essential services to the project who is also not easy to replace. Although this clearly impacts the project's overall credit risk, it would not be assessed by the standardized methodology and has to be added (Moody's, 2007).

2.1.2 Operation-phase risk assessment

Moody's assesses the risk during the operation phase with a qualitative scoring model. In a first step, the criteria proposes to look at the project risk. Starting by categorizing the complexity of the project operations, contractual risks, external influences, sensitivities and termination issues, a first preliminary rating is provided. In a second step, the financial structure is assessed by looking at minimum and average post-tax Debt Service Coverage (DSCR) figures, as well as at cash breakeven. The figures used are then applied to a scale, subsequently notching the preliminary rating up or down by up to two notches. Following the financial analysis, structural features of the project are considered. Step-in-rights and security structure, payments to equity and distribution lock-ups as well as liquidity and other capital structure adjustments are assessed and again notch the existing rating at this point. The methodology leaves the possibility for the analyst to adjust for additional factors affecting the operation-phase

risk which are not covered by the standard methodology. In a fourth and fifth step, the methodology assesses the recovery on concession termination. According to Moody's experience, the LGD of a project ranges between 20% and 30%. It was assumed that the base LGD is 25%, which is subsequently adjusted according to the specifics of the project. These include characteristics of hedge or swap termination payments, timing provisions, project tail and the features of the pay-out formula of the project.

So far the methodology provided an adjusted preliminary rating and a project-adjusted LGD. Applying the adjusted preliminary rating to Moody's rating scale provides the probability of default (PD). Multiplying LGD and PD yields the expected loss, which is to be applied to Moody's idealized expected loss curve to derive a full rating. To finalize this, the rating is adjusted by the concedent's credit rating (Moody's, 2007).

2.2 Fitch's Rating Methodology

In contrast to Moody's, Fitch does not separate the rating process into construction and operation phase but instead uses a holistic approach to rate availability-based infrastructure projects. The approach follows a three-step procedure. Firstly, a project and financial analysis is performed, separated in seven categories using two to five mostly qualitative sub-factors. Secondly, Fitch tests the robustness of the project structure by applying a stress case to the financial model. In a third and final step, where information is available, the agency performs a peer group analysis, comparing the project at hand with precedent projects in the same sector and region. Fitch states that ratings in project finance are unlikely to exceed the A-category due to the idiosyncratic risk associated with the non-recourse character as well as the very low equity contribution (Fitch, 2013). However, with credit enhancements present, the bond's rating in the EU could even breach the sovereign ceiling up to two notches above the

sovereign rating, since Fitch considers the transfer and convertibility risk as negligible⁹ due to EU mechanisms in place. In general, Fitch's ratings give an opinion on the probability of default (PD) of a project, disregarding potential recoveries in the case of a possible default.

2.2.1 Project and financial analysis

The analyst can assign either a “weak”, “midrange” or “strong” attribute to each sub-factor of the seven categories. Fitch states that the majority of their rated availability based projects ended up in the BBB and BB categories. Following this statement it was assumed that the sub-factor assessment with a strong attribute corresponds to an A-rating, while midrange corresponds to BBB and weak corresponds to BB.¹⁰ Within a category, all sub-factors are weighted equally while the categories themselves are weighted according to the specifics of the project and to the assessment by the analyst and the rating committee. For example, Fitch puts more weight on the assessment of the revenue risk if the agency considers this part as a weak point of the project. The attributes assigned are translated into PDs, and by taking the weighted average of all categories, a preliminary rating for the whole project is formed.

During the construction phase, operating assessments do affect the rating while in the operation phase the completion-risk assessment is disregarded. In general, a counterparty upon whom the project has a dependency on may constrain the rating unless the contracted relationship is enhanced through an additional security package. Fitch recently published a change to its assessment of the completion risk. Instead of deriving a PD for this category, a rating cap is introduced. By assessing the project's

⁹ Transfer risk: not being able to transfer money back home from the country the investment took place
Convertibility risk: not being able to convert foreign currency back to the investor's currency

¹⁰ This approach was confirmed during a telephone call with a senior analyst

complexity and scale, the construction contract terms as well as the contractor experience and its replaceability, the project's rating can be restricted to sub-investment grade or be capped by the constructor's credit rating.

2.2.2 Stress case

The preliminary rating formed by the assessment of the key category is then adjusted by the financial robustness of the project structure. In order to do so, Fitch develops a stress case, which tests the strength of the cash flow. As a starting point, the agency builds a base case, generally matching the sponsors' base case, but reflecting Fitch's own macro forecasts (GDP, inflation, etc.) with a slightly more conservative view, eliminating any built-in optimism. In order to transform the base case into the rating case, project and financial stresses will be applied to areas which Fitch considers critical. Project stresses include delays, changes in input or output prices, life-cycle cost and other. In addition, changes to structural and legal features are also tested, as well as hedging agreements and the impact of basis risks. On the financial side, Fitch puts stress on macro inputs (inflation, interest and foreign-exchange rates). These stresses may implicate a contractor default, which may lead to further costs caused by replacing the defaulted contractor. All stress factors are tested to the point where DSCR falls to 1.0x. The magnitude of the increase necessary to achieve this is then applied to a scale to transform the robustness into a compatible score. Unfortunately, Fitch has neither made their exact approach to build the stress case public nor did they publicize the scale mentioned above.

2.2.3 Peer group analysis

With the peer analysis, Fitch draws on similar¹¹ rated projects in order to compare individual factors of the project at hand both on qualitative and quantitative considerations. The comparison serves either as a confirmation of the preliminary rating or as a trigger for an adjustment, notching the project up or down in order to ensure consistency across all comparable rated projects. (Fitch, 2013)

2.3 Standard and Poor's rating methodology

Standard and Poor's (S&P) uses an extensive framework made of several different modules to assess the credit risk of a project finance. The Stand Alone Credit Profile (SACP) builds the basis of S&P's final rating. If the project is currently in the construction phase, a SACP will be determined both for the construction and for the operations phase. S&P wants to represent the project's credit quality at its weakest period, therefore the agency selects the weaker SACP of both phases for further adjustments. The main adjustments are made based on the counterparty risk, a potentially weak transaction structure and the likelihood of extraordinary governmental support. It is important to understand that S&P's rating reflects the debt facility's probability of default through the whole tenor, rather than over three-to-five years, which is common for corporate credit ratings. (Standard and Poor's, 2007)

2.3.1 Construction-phase risk assessment

In the beginning, the criteria proposes a qualitative scoring system assessing the risk stemming from "Technology and Design", "Construction Risk" and "Project Management". Subsequently, the "Funding Adequacy" and "Construction Funding" in

¹¹ Same sector, geographical area

particular finalize the “Construction Phase SACP before counterparty adjustment”. “Technology and Design” includes an assessment of the selected technology’s track record in similar applications and an evaluation of how well the selected technology matches the contract requirements and expectations. In addition, it considers the degree of design completion costing as well as the cost planning certainty. The “Construction risk” includes an assessment of three non-equal weighted sub-factors: 50% is allocated to the evaluation of the “Construction difficulty” while the remaining 50% are equally split between an estimation of the “Contractor experience” and the “Type of contract to risk transfer”.

The combination of “Technology and Design” and “Construction Risk” forms a preliminary SACP, which is subsequently adjusted by an assessment of the “Project Management”. This part considers aspects like “Construction and Cash Management”, “Project Management Expertise” or “Planning and Budgeting Execution Risk”. It can be assumed that the sub-factors in the published criteria are only a framework, where the analyst is able to add or remove suitable or unsuitable sub-factors.

Following the assessment above, the criteria proposes further to consider the project’s Funding Adequacy (uses of funds) and the Construction Funding (sources of funds). This step instructs to compare all available funds against all expected uses in the base-case and particularly in the downside-case. The outcome of this analysis offsets the preliminary SACP achieved subsequent to assessing the project management factors by a maximum of four notches or caps the rating at this point to ‘b-‘ if the funding adequacy or construction funding is assessed as uncertain. (Standard and Poor’s, 2013)

2.3.2 Operation-phase risk assessment

The methodology is divided into two sections. The first section assesses the business, the second section the financial and other issues of the project. Starting with the Operations Phase Business Assessment (OPBA), the analyst is asked to categorize the project in terms of operating complexity on a scale from 1 to 10, where a score of 1 would represent an easy asset and a score of 10 a highly complex one. The initial score is then adjusted by a subsequent analysis of the project-specific contractual terms. Following this, the “Performance Standards” are categorized, which further adjusts the preliminary OPBA. “Performance Standards” are imposing revenue risks on the project by defining reduction in revenue, penalties or even a contract termination. The final adjustment focuses on the country risk. The analyst is prompted to categorize the country in regard to economic, institutional and governance effectiveness and financial system risk as well as risk stemming from the payment culture/rule-of-law on a scale from 1 to 6, which is then merged with the preliminary OPBA assessment. The final OPBA can range from 1 to 12, where a score of 11 or 12 is not able to provide the basis for a better than ‘b’ SACP.

In the financial section, the criteria proposes to oppose the OPBA with the minimum forecasted DSCR in order to establish the preliminary operations phase SACP. In addition, it is checked for four special cases (e.g. excessive leverage), each offsetting the preliminary SACP by one notch. Subsequently, the preliminary SACP is adjusted by a downside analysis, a liquidity assessment to provide an assessment of the project’s ability to cover forecasted debt service, a refinance risk assessment as well as a peer group assessment. (Standard and Poor’s, 2013)

2.3.3 Construction and operation counterparty risk adjustment

In order to finalize the construction and / or operations SACP, the counterparty adjustment module will potentially cap the previously established SACPs. This methodology evaluates the project's exposure to contractually bound parties, e.g. the concedent, the construction or operation company and their replaceability. If a counterparty is material to the project, the counterparty will cap the rating either with its Issuer Credit Rating (ICR) or with an upwards adjusted version of the ICR, the Credit Dependency Assessment (CDA). In case the counterparty cannot be replaced and provides no regulated or essential service, the SACP is capped at the ICR of the construction or operation company. If it is replaceable, however, the credit enhancement packages are opposed to the potential cost of replacing the counterparty under a base-case and a worst-case scenario. If the credit enhancements in place are able to cover the potential costs, the CDA is adjusted up to three notches above the ICR of that counterparty. (Standard and Poor's, 2011)

2.3.4 Governmental adjustment

S&P regards PPP project companies as Government Related Entities (GREs). With the governmental adjustment module, S&P assesses the likelihood of timely and sufficient extraordinary support from the government to the project company in case the project gets into financial trouble.

According to the rating agency, the likelihood is a function of the 'Importance of the GRE's role to the government' and the 'Strength and durability of the link between the government and a GRE'. The higher the importance of the GRE's role to the government and the closer the link between the GRE and the government, the higher the likelihood of extraordinary support is categorized. The likelihood of extraordinary

support ranges from ‘Low’, where the SACP will not be adjusted at all, to ‘Almost certain’, in which case the SACP would be uplifted to the sovereign rating. (Standard & Poor’s, 2010)

2.3.5 Transaction structure

The transaction structure criteria provides a governance framework that sets up the project’s scope and defines potential business and financial risks in order to determine to which extent senior debt lenders are exposed. The assessment examines the ‘Linkage to Parents’ and the ‘Structural protection’ of senior lenders to the project risks. The outcome of both parts is then combined and caps the final SACP by a combination of the parent’s ICR and the initial SACP. (Standard & Poor’s, 2013)

2.4 Comments on the analysis of rating methodologies

All three rating agencies have updated their project finance methodologies within the last year or have announced their intention to do so in the near future. This shows the dynamic changes in the project finance sector and the rating agencies’ adaptability. Still, all three agencies show significant differences in their approach. Moody’s stochastic construction phase approach stands out from the others. Casserly (1994) describes this approach as the “Segmentation Strategy”. Segmenting projects according to the project type and its complexity draws on historic data and experience. However, due to the complex interconnections in project finance, this approach is considered less than ideal. The fact that Moody’s has announced that it will replace the stochastic approach may be seen as a confirmation of Casserly’s description.

Nevertheless, all agencies have the ultimate goal to increase their predictive power. Unfortunately, there is not enough historic data available to analyze the rating correctness of PPP project ratings. Currently, Moody’s has 79 infrastructure projects in

their rating portfolio; S&P has 56 and Fitch only 26. Looking at the rating distribution of all agencies, it is notable that most ratings range in the BBB category while the remaining rating allocation is skewed to the A category. Moody's and S&P have both rated 36 identical projects. Interestingly, according to this data Moody's rates projects 0.6 notches better than S&P. However, comparing Moody's with Fitch shows that Fitch rates the same project 0.7 notches higher than Moody's (based on 7 projects). Unfortunately, there are only two projects which have been rated by both Fitch and S&P. Both projects received the same rating. However, due to the limited data the significance of this information is very low.¹²

3 Development of the rating simulation tool

As a main part of this WP, a rating simulation tool was developed based on the published rating criteria report as well as on direct correspondence with the agencies. The Excel workbook contains a merged input sheet, where the inputs for all rating methodologies are made, and an output sheet showing the results, which are calculated in three separate calculation sheets, one for each rating methodology. The calculation references are grabbed from the Lookup sheet.

The model contains all above-mentioned methodologies except the construction phase assessment by Moody's. After several calls and emails with Moody's analysts it was not possible to gain enough information to recreate or fully understand their approach. In light of the announcement to move away from this approach in the coming months, further analysis of this approach was suspended. Yet, Moody's provides an online rating simulator, which is a suitable for the further analysis of the methodology.

¹² All data has been retrieved from the online rating portals of Moody's, Fitch and S&P

3.1 Identifying major rating drivers

Having reviewed and tested all project finance methodologies of Moody's, Fitch and S&P in the model, several elements stood out by their impact on the final rating. During the construction phase, the complexity and scale of the project greatly affects the further rating assessments. E.g. by categorizing the project as "highly complex", all three agencies require a considerably experienced construction contractor with sound financial stability. Likewise, the contractor represents a critical counterparty in the construction phase. On paper, the construction risk of a simple project seems mitigated by a construction contractor with an average rating. But even with low construction risk, the project is exposed to the counterparty. By having been too aggressive in its pricing, a likely cost overrun may drive the contractor into bankruptcy, which would severely affect the project. Therefore, Fitch and S&P propose a rating cap for contracting an inadequate construction company. In order to absorb potential weaknesses of a contractor, the support packages play a central role in the overall assessment (either liability caps or third-party guarantees). Finally, the construction contract specifics also count as key rating drivers, since they determine the exposure to cost or schedule overruns and can affect the likelihood of a project default.

The operations phase rating is especially influenced by the contractual structure regularizing the payment scheme and effects of events which impair the operational performance of the project. These factors are accompanied by the assessment of the financial stability via key ratios (e.g. DSCR has a 14.3% weight to Fitch's rating) with base-case and stress-case assumptions. Only Moody's operations phase methodology puts neither much weight nor restrictive power to DSCR figures. Similar to the construction phase, the operating complexity paired with the experience, rating and

replaceability of the operating contractor are strongly driving the rating. Overall, the credit rating of the concedent is most critical since a default would trigger an instant project default due to the irreplaceability and potential effects on all parts of the country's economy. Especially with availability-based revenue schemes, the project takes sovereign risk.

4 Analyzing two case studies of existing projects

In order to test the rating tool and illustrate the differences in the rating methodologies, two case studies of existing projects have been analyzed. In both case studies, the NHS Trust is the concedent. Since the UK Department of Health is the trust's parent department, both projects can be considered as PPPs.

Coventry & Rugby Hospital is a greenfield construction project in the UK. A GBP 407.2mn bond was issued in 2002, comprising construction and operation phase and rated by S&P and Moody's. The project is financed with a high leverage of 91% and a low average DSCR of 1.2x. Although the bond is insured by MBIA Assurance, the following paragraph refers to the unenhanced rating of the underlying project.

S&P issued its first unenhanced rating in October 2005, assigning a rating of BBB, reflecting the experienced contractor and good construction progress. In March 2007, Moody's assigned an equivalent Baa2 rating, taking into account the completion of the main construction. In October 2008, Moody's upgraded its rating to Baa1 due to the increasingly established operational performance track record. According to the pure rating criteria replicated in the model, the rating would range in the A-category. Hence, the rating committee must have decided to let the minor unresolved construction issues lower the rating by one notch. In contrast, S&P downgraded the project to BBB- in August 2009, considering the more aggressive than expected financial policy, letting the

DSCR drop to 1.15x in the period between 2031 and 2037. Moody's methodology considers this fact only to a small extent, as they incorporate the DSCR only on a full bond tenor perspective. Interestingly, Moody's did not follow the rating action by S&P and further upgraded the project's rating to A3 in October 2009, referring to the continuation of the issuer's good operational performance track record while the previously existing small construction issues were well mitigated to good subcontractors. In April 2011, S&P factored in the continuing impairment of the financial profile as well as an increasing reliance on interest income when downgrading the bond to BB+. Only in November 2012, Moody's followed S&P's view and lowered the project to Baa1 mainly due to the weak DSCRs. The rating model for Moody's results in a rating of A2, showing a two-notch difference. Consequently, the rating committee again had to lower the rating out of the criteria's scope.

The second case study is Derby Healthcare. This project is a similar project to Coventry and Rugby Hospital and was rated by Fitch and Moody's. Under a 40-year concession, the concessionaire is obligated to redevelop and operate the hospital. The funding was partly done by issuing an insured GBP 446.6mn bond including construction and operation phase. The project was structured with similar high leverage (avg. and min. DSCR of 1.2x). As above, the following analysis refers to the uninsured project rating.

In July 2003, Fitch assigned an underlying rating of BBB, while Moody's assigned a rating of Baa3 (i.e. one notch lower) in the same month. Fitch viewed the scale and complexity of the construction phase as the key risk, potentially introducing difficult interface issues between construction activities and other services. However, the tight contractual structure as well as the experienced subcontractors were supporting the BBB

rating. Moody's likewise honored the experienced construction company and highlighted the relatively straight-forward construction requirement. However, the aggressive leverage did constrain the rating due to the limited buffer provided during construction phase. While Moody's did upgrade the rating two times (one notch in March 2009 and one notch in October 2009) to Baa1 due to the advancing construction progress, Fitch did not change its initial rating. This is somehow surprising, as Fitch did initially categorize the construction risk as the project's key risk. Using the model, Fitch's rating very hard to reproduce.¹³

4.1 Characterizing agencies' rating methodologies

After having attempted to reproduce the ratings of the projects described in the case studies above, the rating methodologies were assessed on the basis of three criteria:

1. *Transparency: visibility of the procedures behind the rating process*
2. *Flexibility: ability to adjust methodology for project specific circumstances*
3. *Comprehensiveness: inclusion of all credit risk relevant aspects and assessment based on their individual importance for the rating*

Moody's provides good transparency through good documentation of both its methodologies. Only the stochastic construction phase approach is a bit opaque, but will be replaced soon. Moreover, the rating model was able to replicate the rating of the case studies above. Admittedly, the case study revealed a lack of flexibility as the methodology was not considering the increasing financial trouble of the project and had to be adjusted outside the criteria's scope later on. The overall comprehensiveness can be seen as medium. Although the inputs do cover a wide range of relevant aspects, the stochastic approach is very predetermined with only a limited number of inputs.

¹³ Sources for both projects: Presale reports and credit action reports of Moody's, Fitch and S&P

Fitch's methodology on the other hand provides great flexibility by enabling the analyst to change the weights of the different assessment categories. This, however, results in bad transparency. Using equal weights, the rating model was not able to replicate the given rating. The methodologies' comprehensiveness appears to be low due to the low number of inputs and the limited three-step assessment scale.

Standard & Poor's provides good transparency due to extensive documentation of their approach, which also helped to replicate the rating of the project in the case study above. The fact that the methodology recognized the worsening financial situation in the case study and its modular composition demonstrates great flexibility. Overall, this methodology appears to be the most comprehensive one, providing an extensive tool to assess the credit risk of project finance bonds.

5 Conclusion

The analysis of the rating methodologies' documentation and additional correspondents with analysts provided a good basis to build the rating model showing the agency's willingness to improve transparency. Although some areas of the rating assignment remain black boxes (i.e. decisions by the rating committee), the ultimate goal to build a tool providing indicative ratings and sensitivity analysis was reached.

The identified key rating drivers show that the main risk does lie in the construction phase while availability-based PPP projects are heavily exposed to sovereign credit risk over the whole concession's tenor.

For further assessment it would be interesting to analyze the predictive power of PPP project bond ratings, once enough ratings have been produced to provide significant results.

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