



MACROECONOMICS, TRADE AND INVESTMENT

## EQUITABLE GROWTH, FINANCE & INSTITUTIONS INSIGHT

Credit Rating Tool to Assess  
and Quantify Credit Risk from  
Public Corporations

GUIDANCE NOTE



# Credit Rating Tool to Assess and Quantify Credit Risk from Public Corporations: Guidance Note

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# Abbreviations and Acronyms

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DDO	Disbursed Debt Outstanding
DL	Debt Liabilities
DSCR	Debt Service Coverage Ratio
EAD	Exposure at Default/Distress
EBITDA	Earnings before Interest, Taxes, Depreciation, and Amortization
EL	Expected Loss
ER	Expected Recovery
GDP	Gross Domestic Product
IBRD	International Bank of Reconstruction and Development
IMF	International Monetary Fund
MS	Microsoft
NGO	Non-Governmental Organization
NPV	Net Present Value
PC	Public Corporation
PD	Probability of Default/Distress
PDMO	Public Debt Management Office
PFMA	Public Financial Management Act
PND	Probability of Non-distress
PPP	Public-Private Partnerships
PV	Present Value
QFA	Quasi-Fiscal Activities
ROA	Return on Assets
SFI	State Financial Institutions
SL	Stressed Loss
SOE	State-Owned Enterprises
SR	Stressed Recovery
UL	Unexpected Loss
TA	Technical Assistance



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# Abstract

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**The activities of public corporations can be important sources of fiscal risks to governments.** These fiscal risks can stem from explicit and implicit contingent liabilities (e.g. guaranteed and non-guaranteed debt) and the impairment of assets (e.g. in the form of on-lent loans). To reduce a country's vulnerability to such risks, they should be assessed and quantified. Quantifying risks supports fiscal policy setting by allowing governments to compare the efficiency and effectiveness of alternative policy measures, their impact on fiscal sustainability, and the monitoring of policy implementation.

**Guaranteed, on-lent and non-guaranteed debt of public corporations expose governments to credit risk.** Credit risk, in this context, refers to the risk that public corporations fail to meet their financial obligations in accordance with agreed terms, leading the government to step-in to service their debt. To assess such credit risk, one methodology is to develop credit ratings which are risk rankings usually expressed using letters, numbers, or a combination of both. As rankings, credit ratings provide an assessment of an obligor's creditworthiness relative to the rated universe and are not absolute measures of risk.

**The World Bank has developed a technical assistance (TA) package to assist governments in improving the management of explicit and implicit contingent liabilities from public corporations.** One

part of the TA consists of the evaluation of the credit risk stemming from a public corporation's non-performance of financial obligations to lenders that result in a cost to the central government. Such evaluation is facilitated by the Credit Rating Tool to Assess and Quantify Credit Risk from Public Corporations. The tool involves the scoring of risk factors and aggregating these scores into a credit rating.

**This note provides detailed guidance on the use of the analytical tool and expands on the key concepts underlying the adopted methodology.** The guidance sections describe in detail the required inputs, assumptions, analyses and outputs. The theoretical section defines the credit rating approach, shares international examples in its application, compares it against alternative methodologies, and discusses the rating process.

**Users can apply the analytical tool to various situations, including to inform policy decisions with respect to individual transactions, as well as to portfolio-based analysis.** Key applications for a sovereign risk manager may include the following:

- Supporting decisions related to new guaranteed or non-guaranteed debt, such as their issuance or the setting of risk-based guarantee fees or limits.
- Informing a government's financial oversight of individual public corporations (including the quantification of explicit and implicit contingent liabilities).



# I. Introduction<sup>1</sup>

**The activities of public corporations can be important sources of fiscal risks<sup>2</sup>** to governments. Fiscal risks can stem from explicit and implicit contingent liabilities (e.g. guaranteed and non-guaranteed debt, respectively), the impairment of assets (e.g. in the form of on-lent loans), and fluctuations in equity values or regular flows to government (e.g. dividends, royalties, and taxes). They can also derive from government's regular (e.g. operating and capital subsidies, transfers, etc.) and non-regular financial support to public entities (e.g. equity injections), their statistical reclassification, corruption, among other factors.

**To strengthen risk management, risks should be assessed and quantified.<sup>3</sup>** Quantifying risks supports fiscal policy setting by allowing governments to compare the efficiency and effectiveness of alternative policy measures, their impact on fiscal sustainability, and the monitoring of policy implementation.

**Credit rating is one of the methodologies commonly used for credit risk assessment and quantification.** Rating agencies, the World Bank, and multiple governments (e.g. Ghana, Indonesia, Mozambique,

South Africa, Sweden, and Thailand) use credit ratings to assess credit risk (Section IV.b). Other common approaches include scenario analysis, simulation models, statistical models, structural models, and the use of market prices (Section IV.c).

**This guidance note accompanies a stylized analytical tool to assess and quantify credit risk from non-financial public corporations.<sup>4</sup>** This Microsoft (MS) Excel-based analytical tool for rating public corporations is available online.

**The stylized analytical tool and this guidance note are complementary to existing tools and papers published by the World Bank.** The World Bank paper "A Framework for Managing Government Guarantees" (Razlog, Marrison, & Irwin, 2020)<sup>5</sup> provides a checklist of issues for a government to consider when designing or revisiting its framework for managing guarantees. The framework is supported by a scenario analysis tool and guidance note. Other relevant World Bank publications related to contingent liabilities from public corporations and government guarantees, and their quantification include (World Bank Treasury, 2019), (Bachmair, 2016), (Currie & Velandia, 2002), (Bachmair, Aslan, & Maseko, 2019).

**The stylized analytical tool does not imply a recommendation by the World Bank.** The World Bank acknowledges the respective advantages and

1. This tool was developed by a team led by Cigdem Aslan (Lead Debt Specialist). The team was comprised of Hakan Yavuz (Senior Debt Specialist) and Esin Celasun (Consultant), with contributions from Tsegaye A. Assayew (Operations Officer). The earlier version of the tool and guidance note were prepared by Fritz Bachmair (Consultant). The tool benefitted from the comments and contributions of Sebastian Essl (Senior Economist), Ralph Van Doorn (Senior Economist), Chris Marrison (Consultant) and Noel David Gallardo (Consultant). Peer reviewers were Luca Bandiera (Lead Economist), Lars Jessen (Lead Debt Specialist), Andre Proite (Senior Debt Specialist), Kjetil Hansen (Senior Public Sector Specialist), and Mikel Tejada Ibanez (Public Private Partnerships Specialist). The tool and the guidance note were cleared by Marcello Estevao (Global Director) and Ivailo Izvorski (Practice Manager).

2. Fiscal risks are factors that may cause fiscal outcomes to deviate from expectations or forecasts (International Monetary Fund, 2016).

3. Various sources highlight the importance of risk assessment and quantification with respect to public corporations and government guarantees, including (Allen & Alves, 2016), (Bachmair, 2016), (International Monetary Fund, 2016), (Razlog, Irwin, & Marrison, 2020), (Saxena, 2017), and (World Bank Treasury, 2019).

4. The credit rating framework can be extended to financial public corporations, private corporations, project companies, subnational governments, and others, but the analytical tool is currently not reflecting risks specific to such entities.

5. The paper, guidance note, and scenario analysis tools can be downloaded at [https://www.worldbank.org/en/topic/debt/publication/government-guarantees-a-framework-and-scenario-analysis?cid=SHR\\_SitesShareLI\\_EN\\_EXT](https://www.worldbank.org/en/topic/debt/publication/government-guarantees-a-framework-and-scenario-analysis?cid=SHR_SitesShareLI_EN_EXT).

disadvantages of alternative risk assessment methodologies and how the choice among them depends on the country context (including, for example, the availability of information and data, resources available, and staff capacity; Section IV.c). Furthermore, the rating criteria (e.g. choice of rating factors, scoring guidance and benchmarks, and weights; Sections III.b and III.c) are applicable to a generic set of non-financial public corporations. A tailored application needs to factor in sector-specific risk drivers and benchmarks and country-specific accounting standards, among others.

**This guidance note starts directly with the introduction of the excel based tool and concludes with the key concepts underlying the credit rating methodology used.** Section II provides an overview of the analytical tool, while Section III guides users through the worksheets of the analytical tool in more detail. Section IV provides the theory behind the credit rating methodology by defining the credit rating approach, sharing international examples in its application, comparing it against alternative methodologies, and discussing the rating process.

## II. Overview of the Analytical Tool

**The analytical tool requires users to provide inputs, performs analyses, and generates outputs.** Users must provide general (e.g. definition of distress, Gross Domestic Product (GDP), currency, etc.) and specific (e.g. financial ratios, cash-flows of relevant debt liabilities, key parameters of the regulatory and operating features of the sectors the public corporations operate in, corporate governance framework, etc.) inputs. The analytical tool provides a generic rating methodology, but users are encouraged to tailor these inputs. Analyses include the assignment of overall ratings to public corporations, and the calculation of various quantified risk measures (e.g. expected losses, stressed losses). Outputs show the quantified risk measures and how they may be used to inform policy-decisions (e.g. with respect to fees and limits), as well as macro-fiscal planning (e.g. with respect to provisioning for losses in the budget).

**Users can apply the analytical tool to various situations, including to inform policy decisions with respect to individual transactions, as well as to portfolio-based analysis.** Key applications for a sovereign risk manager may include the following:

- Supporting decisions related to new guaranteed or non-guaranteed debt, such as their issuance or the setting of risk-based guarantee fees or limits.
- Informing a government's financial oversight of individual public corporations (including the quantification explicit and implicit contingent liabilities).

**The analyses undertaken aim to assess and quantify credit risk only.** The credit rating performed in the analytical tool helps assess a public corporation's capacity and willingness to honor financial obligations to lenders. The methodology does not target other sources of fiscal risks, such as the fluctuations in equity values, operating and capital subsidies, dividends and

taxes, or accounting issues. A holistic assessment of all fiscal risks from public corporations may require a more demanding analytical approach, such as comprehensive cash-flow models using scenario analysis or simulations for risk modeling.

**To reduce complexity, the analytical tool uses multiple exogenous assumptions.** Exogenous assumptions<sup>6</sup> are hard coded into the tool and cannot be changed. In addition to Table 1, exogenous assumptions are described in the footnotes in the analytical tool itself.

**The stylized analytical tool is generic and should be tailored by users to country- and sector-specific factors.** The rating methodology aims to be applicable to a wide range of corporations in many countries. As a result, it may fail to capture sector-specific (e.g. public corporations operating in cyclical sectors may require additional safety margins in the form of liquid assets or reduced risk exposure in the debt structure) and/or country-specific risk drivers (e.g. applying national accounting standards may result in different financial ratios from those computed using international accounting standards). It may also distribute risk weights inappropriately (e.g. public corporations in highly regulated sectors may be disproportionately affected by the regulatory environment).

**Over time, users should develop the capacity to differentiate among sectors and include country-specific factors in the rating methodology.** Probabilities of default/distress used in the analytical tool also depend on multiple assumptions. In addition to amending methodological inputs, users may also consider more demanding changes to exogenous assumptions shown in Table 1.

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6. As opposed to endogenous assumptions which can be changed by users.

**Table 1. Selected exogenous assumptions of the analytical tool**

Worksheet	Exogenous Assumptions
1. General Inputs	<p>A distress event can be defined in two different ways.</p> <p>Up to 10 public corporations can be analyzed in one file.</p> <p>All cash-flows need to be expressed in the same currency. Hence, the analytical tool cannot model exchange rate changes endogenously.</p> <p>The maximum time horizon for risk quantification and outputs shown is 45 years.</p>
2. Rating Methodology	<p>The credit scorecard has five distinct credit risk categories.</p> <p>The credit scorecard assesses three business profile factors and five financial profile factors.</p>
3. Rating Scorecard	<p>Users are required to score the eight rating factors for each public corporation. The weighted average score of these sub-factors is the final score that is used to reach the public corporation's credit risk category.</p>
4. Matching Credit Ratings	<p>Users are asked to match four out of the five possible credit categories to a credit rating in Moody's rating scale, taking into account the sovereign rating and the country ceiling ("In distress" rating requires no matching).</p>
5. Risk Quantification	<p>The analytical tool quantifies risk measures based on disbursed debt outstanding and its repayment profile as of the beginning of the first year of analysis. Future disbursements cannot be added.</p> <p>The analysis allows for annual intervals only. Years are expressed as calendar years but can be viewed as fiscal years where fiscal years deviate from calendar years.</p> <p>All payments are assumed to occur at the end of each period.</p> <p>The debt liabilities are issued at par and do not account for the accrual of interest, particularly relevant in the case of deep-discount or zero-coupon bonds. Only in the case of distress, does the analytical tool assume that the periodic interest payment cannot be made by the public corporation and, if guaranteed, creates a payment from government.</p> <p>References to guaranteed debt liabilities extend to both explicitly and implicitly guaranteed debt liabilities. For the purposes of this analytical tool, the economic nature, rather than the legal nature matters. Hence, guaranteed debt liabilities may be viewed as including debt liabilities (on-)lent by the government to public corporations. Although these are not guaranteed, the corresponding credit risk and impact on the government's fiscal balance may be the same. Users can choose to only include a specific type of debt liabilities (e.g. explicitly guaranteed debt) in the analysis to separate the impact of various government policies, such as explicit guarantees, implicit support, or lending.</p> <p>For each public corporation, only one discount rate may be used. This stylized analytical tool uses a uniform discount rate per public corporation and does not feature the possibility to use distinct discount rates for losses and fees.</p> <p>Governments may recover (parts of) their payments from public corporations in the same year of the payments.</p> <p>When calculating the exposure at default/distress, the analytical tool does not allow for the possibility of exchange rate or interest rate shocks. Such shocks could be applied when the outputs from this analytical tool are used in the Debt Sustainability Analysis templates or the Medium-Term Debt Management Strategy analytical tool.</p> <p>Expected losses are calculated as the product of exposure at default/distress, probability of default/distress and loss given default.</p> <p>Stressed losses are defined as the losses (net of recovery) that the government would incur if the public corporation's credit rating was downgraded. Users select the credit rating under the stress scenario. Unexpected loss is the difference between stressed loss and expected loss.</p> <p>For the calculation of portfolio stressed losses, by default, the analytical tool assumes 50 percent pairwise default correlation between two public corporations for all pairs of public corporations. Users, however, may define distinct correlations for all pairs. Default correlation across the years is assumed to be 100 percent in all loss calculations.</p>

## III. The Analytical Tool at Work

This section provides detailed guidance to users of the analytical tool. Sub-sections are organized according to 11 worksheets (Table 2) in addition to “Instructions” and “Input\_checklist” sheets. Users receive guidance on the inputs they need to provide (sections where user inputs are either required or possible are highlighted in orange in Table 2), the analyses undertaken by the tool, and the generated outputs. Where relevant, the section discusses alternative options for providing inputs, suggests resources for users to develop credit risk assessment capacity, and helps users in interpreting outputs. The section also highlights limitations of the analytical tool and encourages users to reflect on assumptions and stylizations made when interpreting outputs. The “Instructions” worksheet only provides a concise overview of the tool. The factual inputs required by the analytical tool are listed in the “Input\_checklist” worksheet; the list can also be found in the Section V.a.

**The analytical tool is MS Excel-based.** The tool has been developed on MS Excel and uses anglophone number settings (i.e. decimals are separated by “.” and thousands are separated by “,”). No macros are used, all data manipulation conducted by the tool can be traced by viewing formulas. Orange cells are those that need user inputs. Unless users intend to re-program (parts of) the analytical tool, no cells other than orange cells should be altered.

### a. Worksheet “1. General Inputs”

The worksheet “1. General Inputs” enables users to input the basic information and choose the relevant assumption of distress. The worksheet consists of two sections:

- A. General Inputs
- B. Selection of Assumption

The first input in Section A is the “First year of analysis” and it refers to the year after the cut-off date for the debt liability. For example, if the risk rating is assigned on January 1st, 2022, the first year of analysis is 2022 with debt liability data as of December 31st, 2021. Users need to select the currency type, number of public corporations and input nominal GDP figures for the analysis period as well. Cash-flows can be expressed only in the selected currency and the analytical tool cannot model exchange rate changes endogenously. Users can select up to 10 public corporations and add the names of corporations which are reflected automatically to other worksheets. GDP numbers beyond the government’s forecast horizon may be derived from an interpolation of long-term growth trends or from reliable resources such as well-accepted economic reports by international organizations, the country’s non-governmental organizations (NGOs) and academicians.

Section B allows users to select the appropriate distress event definition for the sovereign. The analytical tool aims to serve a wide range of countries and to ensure flexibility to users with different circumstances, therefore two distinct definitions of distress<sup>7</sup> are provided.

*Option 1* assumes that the public corporation defaults, the entire disbursed debt outstanding becomes due and thereafter the government assumes the public corporation’s relevant debt liabilities and repays the (guaranteed portion of) disbursed principal outstanding plus the periodic interest payment due (if interest payments are guaranteed) at the time of default.

7. A third option not accounted for in this analytical tool would be a debt assumption by government where the government assumes responsibility for the debt on the original terms (i.e. the debt liability is not accelerated) as discussed in more detail in paragraph 4.56 of the Public Sector Debt Statistics: Guide for Compilers and Users, 2011.

**Table 2. MS excel structure of the analytical tool**

Worksheets	Sections
Instructions	Overview of the Analytical Tool, Worksheets Description, Step-by-Step Instructions, Further Assumptions Made in the Stylized Analytical Tool
Input_checklist	Inputs Required by the Analytical Tool
1. General Inputs	A. General Inputs B. Selection of Assumption
2. Rating Methodology	A. Rating Scale B. Choice of Rating Factors C. Scoring Guidance D. Weights of Rating Factors
3. Rating Scorecard	A. Rating Scorecards for Individual Public Corporations 1–10 Public Corporations B. Summary of Final Credit Ratings
4. Matching Credit Ratings	Matching Credit Ratings
5. Risk Quantification	A. Risk Quantification for Individual Public Corporations 1–10 Public Corporations B. Portfolio Stressed Losses
6. Outputs	A. Definition of Distress Event B. Credit Rating C. Risk-Impact Matrix D. Debt Valuation and Maximum Losses E. Expected Losses G. Stressed Losses H. Summary Charts for Debt Liabilities, Expected Losses, and Stressed Losses I. Risk-Based Fees J. Provisioning for Losses K. Monitoring of Limits
7. PD (Default and Distress)	Reference Calculation Sheets
8. Migration Rates	
9. PDs - Distress Option 1	
10. PDs - Distress Option 2	
11. PDs - "In Distress"	

On the other hand, *Option 2* assumes a timely intervention by the government, whereby the government makes an annual debt service payment to the lender on behalf of the public corporation or provides financial resources to the public corporation (e.g. in the form of a capital transfer/grant) for it to be able to meet its debt service obligations for a given year. Thus, under *Option 2* the public corporation does not default outright.

## b. Worksheet “2. Rating Methodology”

The worksheet “2. Rating Methodology” describes the uniform methodology used to rate all public corporations included in the file. The worksheet consists of four sections:

- A. Rating Scale
- B. Choice of Rating Factors
- C. Scoring Guidance
- D. Weights of Rating Factors

**Section A shows the analytical tool’s five credit ratings, the corresponding numerical scores, their description, and the 1-year probability of default/distress associated with the credit rating.** The ratings are: Low Risk, Moderate Risk, Elevated Risk, High Risk and In Distress (with the numerical scores ranging from 1 to 5, respectively). The worst rating “In Distress” is reserved for public corporations already in distress and are assigned a 100 percent probability of default in the first year of analysis. Ratings are defined on a national scale, and therefore are relative and comparable to entities only within the same country. In most cases, the risk of the “Low Risk” entities is equivalent to the sovereign rating (Section III.d). If users consider defining an alternative rating scale, rating agencies’ definitions may be useful to consult.<sup>8</sup>

8. Check Standard & Poor’s Global Ratings Definitions; Moody’s Rating Symbols and Definitions, and Fitch’s Rating Definitions.

**The analytical tool includes eight rating factors (three business profile and five financial profile factors).** The rating methodology of the analytical tool relies on widely used and generic indicators for the credit risk assessment of corporations, supplemented with indicators specific to public corporations (such as performance in meeting financial obligations to government). To tailor the rating methodology to specific sectors, including the choice of financial ratios and/or the numeric benchmark ranges provided in this worksheet, users can consult a wide range of existing material, including the country methodologies discussed in Section IV.b.<sup>9</sup> To understand, choose, calculate, and score financial ratios, users require an understanding of accounting and finance.<sup>10</sup>

**The scoring guidance helps users in assigning ratings to each of the eight rating factors.** As credit ratings are rankings, scoring guidance helps making a relative assessment, not an absolute assessment. In the analytical tool's rating methodology, "Low Risk" ratings are described as highly credit positive and "High Risk" ratings as highly credit negative. The rating category of "In Distress" can only be assigned to the factor "Performance in Meeting Financial Obligations to Government" (Section III.c). For most rating factors, assigning scores is judgement based and requires experience of analysts as well as a formalized process to ensure quality and consistent application (Section IV.d). The rating methodology provides default generic benchmarks only for financial ratios used to assess profitability, liquidity, and solvency. However, these benchmarks should be treated with caution. Calculated ratios depend on accounting standards and calculation methods. Furthermore,

their significance can be highly sector specific - typical values and their spread could vary greatly across sectors. Users could tailor the benchmarks accordingly in this worksheet.

**The weights of rating factors are used to arrive at a weighted aggregate rating for a public corporation.** The analytical tool's rating methodology assigns a weight of 45 percent to business profile factors and 55 percent to financial profile factors. Weights represent the relative importance of each rating factor in determining credit risk. Weights can be assigned based on judgement; borrowing from existing methodologies, such as the country methodologies described in Section IV.b and rating agency methodologies; or statistical analysis.

**To apply distinct rating methodologies to public corporations, users may save the analytical tool in separate files.** As recommended, over time, users may develop sector specific rating methodologies. In this case, each file could capture all public corporations in a specific sector.

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### c. **Worksheet "3. Rating Scorecard"**

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**The worksheet "3. Rating Scorecard" is where users assign scores to individual rating factors for each public corporation.** The tool aggregates the individual scores into the final rating and shows the completed rating scorecards. The worksheet consists of two sections:

- A. Rating Scorecards for Individual Public Corporations
- B. Summary of Final Credit Ratings

**Users start the credit analysis by assessing the business profile factors.** Under each of the three business profile rating factors (Regulatory Environment, Sector Risk and Competitive Position, Governance and Management), there is a list of questions that need to

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9. Including, for example, rating agency methodology papers. Check Moody's, Standard & Poor's, and Fitch for a list. Appendix 2 of (Razlog, Marrison, & Irwin, 2020) discusses the types of risks faced by different types of companies.

10. Multiple online and offline resources for training are available on sites such as [academiccourses.com](https://academiccourses.com), [corporatefinanceinstitute.com](https://corporatefinanceinstitute.com), [coursera.org](https://coursera.org), [edx.org](https://edx.org), [fitchlearning.com](https://fitchlearning.com), [udemy.com](https://udemy.com). Relevant courses may include cash flow analysis, corporate finance, financial accounting, financial analysis or ratio analysis.

be scored from 1 to 4<sup>11</sup>. These questions complement the more general guidance provided in the “2. *Rating Methodology*” worksheet. The numerical averages of the scores of the individual questions make up the scores of the three rating factors. Users should score the questions from the point of view of the government and always keep in mind the ultimate objective of the scorecard: assessing the likelihood of the public corporation not honoring its financial obligations, and as a result, forcing the government to make payments to a creditor on its behalf, either as the guarantor or as the on-lender.

**The three business profile rating factors focus on the main external and internal elements that affect the public corporations.** The ‘Regulatory Environment’ factor aims to assess how conducive the regulations (tariffs, taxation, other operational and financial obligations pertaining to a specific sector, etc.) are to the entities’ productivity and financial strength. The ‘Sector-Risk and Competitive Position’ factor is about the structural risks of the sector in which the public corporations operate (such as competitiveness, stage of development, cyclicity, barriers to entry, etc.) and their position within this sector<sup>12</sup>. Finally, the ‘Governance and Management’ factor considers the quality and the level of sophistication of the public corporations’

governance practices, management structure and strategy setting<sup>13</sup>.

**The existence and, if any, the impact of quasi-fiscal activities (QFAs), which are particularly relevant for public corporations, are assessed under the ‘Governance and Management’ factor.** QFAs are activities that are undertaken at the direction of the government to further a public policy objective and are fiscal in character—that is, in principle, they can be duplicated by specific fiscal measures, such as tax, subsidies, or other direct expenditures<sup>14</sup>. While assessing these in the analytical tool, users should remember that QFAs do not necessarily always increase fiscal risks. For example, if they are part of the business model and constitute part of the mission of the entity, and if the government compensates for these - often non-profitable - activities on a regular, timely and sufficient manner through transparent budgeting, the QFAs would be neutral for fiscal risks.

**Users could refer to two related indicators used under the ‘Government Relationship’ factor of the International Monetary Fund’s (IMF) SOE Health Check Tool<sup>15</sup>** to assess the extent and impact of QFAs on public corporations. These ratios and their classification are as follows:

$$a. \text{ Government Transfers to Total Revenue} = \frac{\text{Government Grants Received}}{\text{Total Revenue including Government Grants}}$$

$$b. \text{ 50\% Test} = \frac{\text{Cost of Goods Sold} + \text{Other Operating Expenses} + \text{Finance Cost} - \text{Finance Income}}{\text{Revenue from Trading Activities} + \text{Other Operating Income}}$$

11. The individual questions are based on considerations provided in Fitch’s rating criteria report titled ‘Sector Navigators - Addendum to the Corporate Rating Criteria’, which can be accessed at <https://www.fitchratings.com/research/corporate-finance/sector-navigators-addendum-to-corporate-rating-criteria-15-10-2021>.

12. This factor should not be confused with considerations regarding the operating environment and other country risks (such as macroeconomic environment, political risks, rule of law, etc.). The analytical tool produces credit ratings for public corporations of a single country; therefore such considerations are equal for all entities.

13. The corporate governance framework for public corporations is established by the government and likely applies to all public corporations. The Organization for Economic Co-operation and Development (OECD) has set guidelines for sound SOE corporate governance and tracks member country’s progress in implementing them.

14. The IMF’s note on “How to Improve the Financial Oversight of Public Corporations” discusses the types of QFAs in more detail.

15. <https://www.imf.org/en/Topics/fiscal-policies/Fiscal-Risks/Fiscal-Risks-Toolkit/Fiscal-Risks-Toolkit-SOE-HCT>

	Category 1	Category 2	Category 3	Category 4	Category 5
Government Transfers to Total Revenue	<0.3	0.3–0.4	0.4–0.5	0.5–0.6	>0.6
50% Test	<0.70	0.7–1.0	1.0–1.5	1.5–2.0	>2.0

where,

Category 1 = lowest risk and Category 5 = highest risk.

**The second step is the assessment of the five financial profile factors.** Three ('Profitability', 'Liquidity' and 'Solvency') of these factors are assessed quantitatively and the remaining two ('Debt Structure' and 'Performance in Meeting Government Obligations') are assessed qualitatively. 'Performance in Meeting Government Obligations' is the only rating factor that objectively assesses the timeliness of a public corporation's debt repayments and therefore is the only factor that can be assigned a credit rating of "In Distress". A rating of "In Distress" on this factor results in an "In Distress" rating for the public corporation overall, irrespective of the weight assigned to this rating factor. The assessment of the three quantitative factors is done through two related financial ratios for each, while the remaining two qualitative factors are evaluated using the guidance provided in the analytical tool.

**For the quantitatively assessed financial profile factors, users are required to input historical and forecasted financial ratios for a total of six periods.** The historical figures are for the past two years, and the forecasted figures are for the current year and the next three years. Forecasts may be obtained from the public corporations themselves, the line ministries to which they belong, or the Ministry of Finance/Treasury. If unavailable from these sources, users could make their own forecasts, based on their judgment derived from both past performance and the macroeconomic, sectorial, or individual business prospects (such as expected changes in competition, demand or the cost base due to changes in commodity prices, etc.). If forecasts cannot be obtained for any period or can only be obtained partially, the analytical tool will calculate the average of the available figures for each of the six ratios. These averages are then assigned a score based on

their position within the benchmark ranges provided in worksheet "2. Rating Methodology". The average of the scores of the two ratios under each factor is then used to assign the final scores of the three factors.

**The analytical tool aggregates the individual scores into a final numerical score and a credit rating in the consolidated scorecard of each public corporation.** On the scorecard, users can manually override the existing formulas for i) rating factor weights, and for ii) the final stand-alone credit rating. The adjustments need to be justified and noted on the scorecard.

**The weights, which reflect the relative importance of rating factors in the overall credit rating, can differ from country to country or sector to sector.** Therefore, country- or sector-specific characteristics are likely to be the most common reason for adjusting the weights<sup>16</sup>. The existence of various government ownership models within a single country could also result in the necessity to tailor weights. Some examples for reasons to adjust weights are as follows:

- Users might want to assign a lower or null weighting to the 'Regulatory Environment' factor of public corporations operating in loosely on non-regulated industries such as the airlines sector, while assigning a higher weight than the default weight to this factor for highly regulated sectors, such as utilities, could make sense.
- For sectors where public corporations are often monopolies, such as rail transport or energy, the weight of the 'Sector Risk and Competitive Position' could be lowered.
- Assigning higher weight to 'Solvency' and 'Debt Structure' factors in sectors where entities have very high levels of debt to finance capital expenditure requirements, such as utilities, could make sense.
- If there are both fully and partially government owned public corporations in a country, the weight

16. Rating agencies have different approaches with regards to the assignment of weights. Under Standard and Poor's and Fitch's corporate criteria, there are no numerical weights, while Moody's criteria provide fixed numeric weights for each sector.

assigned to the ‘Governance and Management’ factor could be higher for the fully owned entities, if governance weaknesses are more evident relative to the partially owned entities.

**The analytical tool uses mathematical rounding when converting the “Weighted average numerical score” to the final rating “Stand-Alone Credit Rating for Public Corporation”.** Users have the option to apply judgement when assigning a final rating, to capture a factor that is not included in the tool and/or that is unique to the public corporation, as long as it is documented and justified. The difference between the “Weighted average numerical score” and the final rating “Stand-Alone Credit Rating for Public Corporation” is referred to as “Notching” and shown explicitly in section B of the worksheet. Notching up and down refer to the improvement and the worsening of the credit rating, respectively.

#### d. **Worksheet “4. Matching Credit Ratings”**

**The worksheet “4. Matching Credit Ratings” is used for matching the public corporations’ credit ratings assigned by the analytical tool to Moody’s alpha-numerical credit scores.** Moody’s credit scores are then used to reach the entities’ annual probabilities of default/distress based on the historical default data compiled, updated and published by the rating agency (see Sections V.c through V.f).<sup>17</sup>

**As the first step, users are required to input Moody’s country ceiling and the sovereign rating of the country where the public corporations are based.** If the sovereign in the respective country is not rated, the user may apply ratings of peer-countries or estimate a sovereign shadow rating<sup>18</sup>. Country ceilings are highly related to and can be at the same level as or above the sovereign ratings. While the sovereign rating reflects the credit risk of the governments, country ceilings cap-

ture transfer and convertibility risks, such as the risk of imposition of capital controls that potentially can prevent domestic (public and private) entities to honor their foreign currency denominated debt. Dedicated rating agency criteria lay out the conditions for when country ceiling can be higher than the sovereign rating<sup>19</sup>.

**In the next step, users match the analytical tool’s four credit ratings (Low Risk, Moderate Risk, Elevated Risk and High Risk) to four distinct credit scores in Moody’s scale<sup>20</sup>.** For public corporations, it would make sense to match the ‘Low Risk’ credit rating to the sovereign rating, on the premises that the likelihood of default/distress of relatively strong public corporations are broadly the same as that of the government.

**In other words, sovereign rating is assumed to be the highest rating achievable for any public corporation in any country.** This is because of the very strong financial links and interdependence between governments and public corporations, and the high contagion risk from the government to the public corporations when the governments approach a default/distress scenario. Furthermore, in the case of a sovereign default, it is very likely that there will be disruption to the country’s financial system, reduced access to foreign currency and increased chances of capital controls, which altogether would impede the capacity of the public corporation to service its foreign currency debt. Lastly, a framework where public corporations’ ratings are higher than the sovereign rating would conceptually be inconsistent with the analytical tool, where the premise is that the government is the guarantor of the public corporations.

**Rarely, and under very specific circumstances, a public corporation’s rating can be higher than the sovereign rating.** Such a choice needs to be documented and justified. For example, if the public corporation has a stable and meaningful revenue source abroad or a minority shareholder based abroad, which could support the servicing of its foreign currency debt even in the case of a sovereign default, a rating higher than the sovereign rating could be considered. Another, but a

17. Standard & Poor’s and Fitch also can be used as alternative sources for matching credit ratings.

18. Check a sample methodology for estimating shadow ratings based on a small number of macroeconomic variables.

19. Check Standard and Poor’s, Moody’s, and Fitch.

20. By definition, the rating “In Distress” of the analytical tool is associated with a 100 percent probability of distress in year 1 and hence requires no matching.

rarer candidate would be an exceptionally strong public corporation, that operates broadly independently from the government, has no track record of needing governmental support, has a diversified revenue and cost base, low foreign currency exposure, etc., and which is expected to withstand a sovereign default, even if that leads to extraction of funds from the entity via large dividends.<sup>21</sup>

**The assignment of credit scores to the remaining three credit ratings (Moderate, Elevated and High Risk) would be based on the judgement of users and definition of ratings.** It would also depend on the level and number of ratings below the sovereign rating: the lower the sovereign rating, the fewer options there will be and the more compressed the distribution of ratings will be. Section V.b describes several approaches for matching credit ratings when the sovereign rating is too low or when the sovereign is in default. The recommended approaches do not apply to the public corporations which can be assessed above the sovereign rating.

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## e. Worksheet “5. Risk Quantification”

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**The worksheet “5. Risk Quantification” is where the risks of the public corporations are quantified, and the stressed losses of the aggregate portfolio are calculated.** The worksheet consists of two sections:

- A. Risk Quantification for Individual Public Corporations
- B. Portfolio Stressed Losses

**In section A, risk quantification for individual public corporations is carried out.** This requires the final credit rating as well as a set of data related to the debt liabilities of the public corporation. The exogenous assumptions of the tool related to these variables are discussed in Section II. The debt liabilities in question could be individual debt instruments (such as a guaranteed or a non-guaranteed or an on-lent loan) or a

portfolio of instruments (such as several guaranteed loans or all debt liabilities) of a public corporation. The data requirements are:

- **Principal Payments:** for an individual debt instrument, these would be the annual debt service payments reflecting the properties of the instrument (e.g. maturity, grace period, equal vs amortizing payments etc.); for a portfolio of instruments these would be the sum of all annual principal payments of all instruments for each year until the maturity
- **Disbursed Debt Outstanding:** this is equal to the undiscounted sum of all future annual principal payments, and, in the year of the debt disbursement, it is equal to the face value of the debt liabilities
- **Interest Rate:** this is used to calculate the annual interest payments (therefore the nominal value of the debt liabilities is equal to their face value in this tool)<sup>22</sup>
- Share of Principal and Interest (Explicitly or Implicitly) Guaranteed or On-lent
- **Discount Rate:** the most commonly used proxy for this variable is the country’s risk-free rate, i.e. the government’s borrowing cost, for a tenor equivalent to the duration<sup>23</sup> of the public corporation’s debt instrument (or weighted average duration for a portfolio of instruments), in the user-selected currency (in the “1. General Inputs” worksheet) and in which the cashflows are denominated
- **Expected and Stressed Recovery:** this is the share of the government support payments that is assumed to be recovered from the public corporation annually, under a base-case and a stress-case scenario, respectively

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<sup>21</sup> In this second example, the public corporation’s rating could go as high up as the country ceiling, while for the first example, under very restricted circumstances the country ceiling could be pierced.

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<sup>22</sup> If the cashflows pertain to a portfolio of debt instruments, the weighted average interest rate on these instruments (based on disbursed amount outstanding for each instrument) could be used. The tool is designed for debt issued at par, therefore, if the cashflows pertain to multi-period zero coupon debt liabilities or debt liabilities issued at a premium or discount, expected (or accrued) interest payments should be calculated separately by the users. For a discussion of the valuation of debt liabilities see, Chapter 2 of the Public Sector Debt Statistics Guide for Compilers and Users (<http://tffs.org/pdf/method/2013/psds2013.pdf>).

<sup>23</sup> Duration of a debt instrument is defined as the time it takes for the creditor (i.e. the holder of the debt instrument) to be repaid the cost of the instrument by its cashflows. In other words, duration is the cashflow-weighted time to maturity of a debt instrument.

Based on the above user inputs, the analytical tool initially calculates the nominal and present value of total and guaranteed debt liabilities, as follows<sup>24</sup>:

- Interest Payments (i) = DDO (at beginning of i) × Interest rate (i)
- Nominal Value of DL =  $\sum_i^t \frac{(\text{Annual principal payment} + \text{Annual interest payment})}{(1 + \text{Interest rate})^i}$
- Nominal Value of Guaranteed DL  
=  $\sum_i^t \frac{(\text{Annual princ. payment} \times \text{share of guarantee} + \text{Annual interest payment} \times \text{share of guarantee})}{(1 + \text{Interest rate})^i}$
- PV of DL =  $\sum_i^t \frac{(\text{Annual principal payment} + \text{Annual interest payment})}{(1 + \text{Discount rate})^i}$
- PV of Guaranteed DL  
=  $\sum_i^t \frac{(\text{Annual principal payment} \times \text{share of guarantee} + \text{Annual interest payment} \times \text{share of guarantee})}{(1 + \text{Interest rate})^i}$

where,

i = 1 to t number of years to maturity;

DDO: Disbursed Debt Outstanding;

DL: Debt Liabilities;

PV: Present Value;

share of guarantee = share of the DL that is guaranteed or on-lent in percentage.

**The next step in the analytical tool is to calculate the expected losses from the debt liabilities of the public corporations.** This calculation is based on the credit rating of the public corporation, valuation of debt liabilities, guarantee characteristics, and recovery assumptions. Expected losses are one of the most used quantified risk measures. They indicate how much the government could lose on average over the life of the debt liabilities. Expected losses are statistical estimates, and it should be kept in mind that actual losses could be well below or well above the expected losses. This is particularly true for small and homogenous debt portfolios. This margin of error and the difference between actual and expected losses narrows as the number of debt instruments and the diversity of the borrowing public corporations grow.

**Annual expected losses are functions of three components.** These are: i) exposure at default/distress, ii) probability of default (for *Option 1*)/distress (for *Option 2*), iii) loss given default/distress. In the analytical tool, expected losses are calculated both excluding and including recoveries. The calculation of PDs are described in Sections V.c through V.f. The variables are defined as follows:

- EAD (i) = DDO (at beginning i) × share of guarantee + Interest payment (i) × share of guarantee
- Annual PD (i) = PD (for *Option 1*) or PD (for *Option 2*) for the credit rating of the public corporation (i)

<sup>24</sup> If interest rates paid on debt and the discount rate are the same, the present value of debt liabilities equals the nominal and face values of the debt liabilities.

where,

EAD: Exposure at Default/Distress;

PD: Probability of Default for *Option 1* or Probability of Distress for *Option 2*.

**Based on the above, the tool calculates the annual expected losses and their net present value as follows:**

- Annual EL (Excluding Recovery) (i) = EAD (i) × Annual PD (i)
- Annual EI (Including ER) (i) = Annual EL (Excluding Recovery) (i) – Annual ER (i)
- PV of Annual EL =  $\frac{\text{Annual EL (Including ER)(i)}}{(1 + \text{Discount rate})^i}$
- NPV of EL =  $\sum_{i=1}^t \text{PV of Annual EL (i)}$

where,

i = 1 to t number of years to maturity;

EL: Expected Loss;

ER: Expected Recovery;

Annual ER (i) = Annual EL (Excluding Recovery) (i) × ER;

NPV: Net Present Value.

**The analytical tool then calculates the stressed losses from the debt liabilities of the public corporations.** Stressed losses are defined as the sum of expected and unexpected losses. In turn, unexpected losses are defined as those losses that might exceed expected losses under severe scenarios. While the probability of unexpected losses materializing is lower, the magnitude is bigger than expected losses.

**The analytical tool defines stressed losses as those that would occur if the credit rating of the public corporation is downgraded.** For this, users are required to select the credit rating under the downgrade scenario. This rating needs to be at least one notch below the public corporation's current credit rating. A one notch downgrade to a credit rating is the most likely scenario. However, multiple-notch downgrades could occasionally take place in a rapidly evolving context, where the financial ratios weaken significantly in a short period of

time either due to an entity-specific or exogenous factor. It could also happen if events signaling corporate governance weaknesses (such as allegations of fraud, etc.) surface. Once stressed losses are determined, the tool calculates the unexpected losses as follows:

- Unexpected losses = Stressed losses – Expected losses

**The calculation of stressed losses follows the same conceptual framework as the expected losses in the analytical tool.** The difference between the two measures stems from the difference between the probabilities default linked to the public corporation's current credit rating and the credit rating under the downgrade scenario. Probability of default increases as credit rating worsens, therefore total stressed losses are always larger than total expected losses<sup>25</sup>. The calculations are carried out as follows:

- Annual SL (Excluding Recovery) (i) = EAD (i) × Annual PD for downgrade scenario (i)
- Annual SL (Including ER) (i) = Annual SL (Excluding Recovery) (i) – Annual SR (i)
- PV of Annual SL (i) =  $\frac{\text{Annual SL (Including ER) (i)}}{(1 + \text{Discount Rate})^i}$
- NPV of Annual SL =  $\frac{\text{Annual SL (Including ER) (i)}}{(1 + \text{Discount rate})^i}$
- NPV of SL =  $\sum_{i=1}^t \text{Present Value of Annual SL (i)}$

where,

i = 1 to t number of years to maturity;

SL: Stressed Loss;

SR: Stressed Recovery;

Annual SR (i) = Annual SL (Excluding Recovery) (i) × SR.

<sup>25</sup> Under Option 1, while total expected losses are always lower than total stressed losses, the annual expected losses could be slightly above annual stressed losses, starting from as early as the 3rd year. Under these circumstances the annual unexpected loss figure would be negative. This difference would be particularly evident for stressed losses associated with credit ratings equal to or below Caa1. This is because, the annual probabilities of default associated with these weaker credit ratings start off very high in the first few years, and then fall sharply subsequently, even if the cumulative probabilities of default are higher than those of higher credit ratings. Under Option 2, annual probabilities of distress grow year-on-year, therefore both total and annual expected losses are always lower than the respective stressed losses.

**The last quantified risk measure calculated on this worksheet of the analytical tool is guarantee fees.**

These are charged to the public corporation (beneficiary) in return for the explicit government guarantees on the debt liabilities. The tool calculates the guarantee fees based on expected losses from the debt liabilities. An alternative would be to base them on market values, for which additional data (such as, to risk premiums demanded by creditors to take on higher risk than the sovereign risk) is needed. Fees based on market values are outside the scope of the tool.

**The analytical tool calculates two alternative guarantee fees: annual fees or upfront fees.** Annual fees are those that need to be paid each year. Upfront fees are paid once upon disbursement. The calculations are as follows:

- Annual Fee = 
$$\frac{\text{NPV of EL}}{\sum_{i=1}^t \text{PV of DDO (beginning of } i)}$$
- Upfront Fee = 
$$\frac{\text{NPV of EL}}{\text{Disbursed Debt (Face Value)}}$$

where,

$i = 1$  to  $t$  number of years to maturity.

**The only difference between the calculations for *Option 1* and *Option 2* are the probabilities of default and distress that are used for the expected and stressed loss calculations.** These two distinct sets of probabilities are calculated in worksheets “9. PDs – Distress *Option 1*” and “10. PDs – Distress *Option 2*”, respectively, as described in Section IV.c. The tool does not calculate fees for *Option 2*, because it would not be realistic to expect a public corporation which receives government support to repay its debt to be able to afford to pay fees.

**Section B of the worksheet calculates the portfolio stressed losses for the government’s entire portfolio of debt guarantees for all ten public corporations.** The inputs are the expected and unexpected

losses (calculated in the first section), and pair-wise default correlations between the ten entities.

**Default correlations are needed to reach aggregate portfolio unexpected losses.** Unexpected losses of individual public corporations are not independent of one another (i.e. a correlation of 0 cannot be assumed). Often, unexpected changes in exogenous factors (such as a sudden rise in interest or exchange rates) impact the entities’ financial indicators in a broadly parallel manner (indicating correlations above 0). In contrast, expected losses are average figures and can safely be considered independent. Hence, the aggregate portfolio losses can be reached by simply adding up the individual expected losses.

**The analytical tool assumes equal default correlations of 0.5 (50 percent) between pairs of public corporations.** The tool gives the users the flexibility to input their own estimates of pair-wise default correlations in the correlation matrix.<sup>26</sup>

**Based on the inputs, the tool calculates annual portfolio unexpected, expected and stressed losses, and their present values, for both *Option 1* and *Option 2*.** These are then used to reach the net present value of portfolio stressed loss. For the calculation of present values, the tool uses the weighted average discount rate (also calculated in this section), which is a proxy for the discount rate of the portfolio, should users prefer to differentiate the discount rates of individual public corporations. Unless there is a very strong entity-specific reason, users are recommended to use a single discount rate for all entities. The above variables are defined as follows:

<sup>26</sup> For a discussion of default correlations and their estimate see, for example, <https://www.moodyanalytics.com/-/media/whitepaper/before-2011/03-03-08-asset-correlation-realized-default-correlation-and-portfolio-credit-risk.pdf>, <https://www.bis.org/bcbs/irbriskweight.pdf>.

- Annual Portfolio UL<sup>27</sup> =  $\sqrt{\sum_{i=1}^{10} \sum_{j=1}^{10} \text{Annual UL of PC } i \times \text{Default correction between PC } i \text{ and PC } j}$
- PV of Annual Portfolio UL =  $\frac{\text{Annual Portfolio UL}}{(1 + \text{Weighted Average Discount Rate})^t}$
- Annual Total EL =  $\sum_{i=1}^{10} \text{Annual EL of PC } i$
- PV of Annual Total EL =  $\frac{\text{Annual Total EL}}{(1 + \text{Weighted Average Discount Rate})^t}$
- Annual Portfolio Stressed Losses = Annual Portfolio UL + Annual Total EL
- PV of Annual Portfolio SL = PV of Annual Portfolio UL + PV of Annual Total EL
- NPV of Portfolio SL =  $\sum_{i=1}^t \text{PV of Annual Portfolio SL (i)}$

where,

t = number of years to maturity,

UL: Unexpected Loss;

PC: Public Corporation;

$$\text{Weighted Average Discount Rate (i)} = \frac{\sum_{j=1}^{10} \text{Discount rate of PC } j \times \text{PV of annual guaranteed DL of PC } j (i)}{\sum_{j=1}^{10} \text{PV of annual guaranteed DL of PC } j (i)}$$

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## f. Worksheet “6. Outputs”

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The worksheet “6. *Outputs*” consolidates the results of the calculations in the previous worksheets and summarizes the main findings of the analysis. The worksheet consists of ten sections:

- A. Definition of Distress Event
- B. Credit Rating
- C. Risk-Impact Matrix/Potential Impact of Expected Loss
- D. Debt Valuation and Maximum Losses
- E. Expected Losses
- F. Stressed Losses

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<sup>27</sup> In the calculation of this ratio for Option 1, in cases where the annual unexpected loss is negative (see footnote 25), the tool sets the value of the annual unexpected loss of the public corporation to 0.

- G. Summary Charts for Debt Liabilities, Expected Losses and Stressed Losses
- H. Risk-Based Fees
- I. Provisioning for Losses
- J. Monitoring of Limits

**Users can see the assigned credit ratings of all public corporations under scrutiny on this worksheet.** Section C of the worksheet generates two risk-impact matrices based on the proportion of i) present value of guaranteed debt liabilities to GDP and ii) net present value of expected losses to present value of guaranteed debt liabilities (see Figure 1 and Figure 2). Users have the flexibility to change the upper/lower bounds of the ranges for the size of the impact.

**The nominal and present values of the total debt liabilities, (guaranteed plus non-guaranteed), as well as the annual debt servicing data for the guaranteed liabilities could be analyzed.** Users can display the debt obligations of the corporations both in nominal

terms and as a share of GDP. Charts are generated automatically to provide a visual view for the comparison of the debt liabilities and the debt servicing profile.

**There are also sections summarizing the expected losses and stressed losses.** Users can display the data and the charts for each public corporation in terms of the total and annual present value of expected (Figure 3) and stressed losses, their share among total guaranteed debt liabilities and as a percentage of GDP. In addition, Section G provides a breakdown of the present value of the portfolio of debt liabilities (Figure 4). This section gives insights about the guaranteed debt at risk both in nominal terms and as a share of GDP. This makes the analyst’s task easier to highlight the riskiest corporations as well as getting the risk decomposition of the portfolio (Figure 5).

**Section H provides information about risk-based fees.** Based on the share of expected losses to be covered by fees input by users, the tool calculates the annual fees and one-time upfront fees. In addition, the

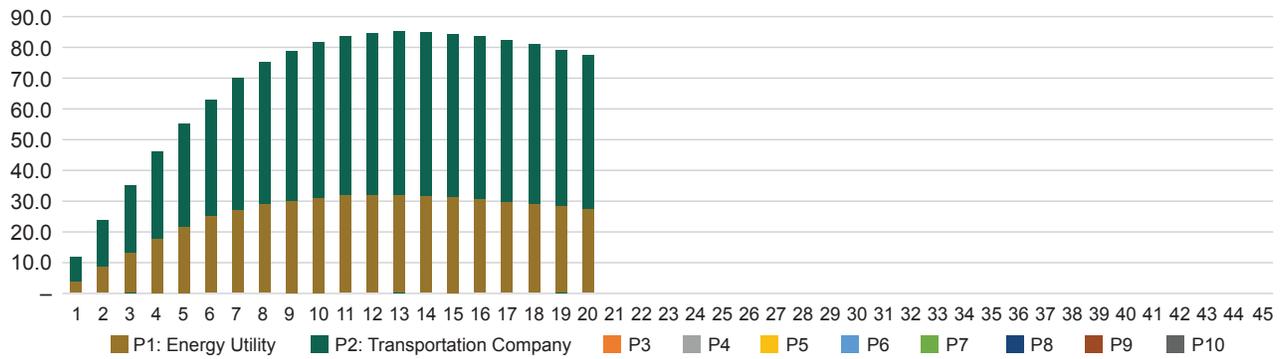
**Figure 1. Risk impact matrix I**

Potential Size of Impact <sup>2</sup>	Large ( $\geq 1$ percent of 2021 GDP)	P2: Transportation Company,	P1: Energy Utility,	
	Medium ( $0.2 \leq x < 1$ percent of 2021 GDP)			
	Small ( $< 0.2$ percent of 2021 GDP)	P3, P5,		P4, P6, P7 ,P8, P9, P10,
		Low Risk and Moderate Risk	Elevated Risk	High Risk and In Distress
		Risk Rating		

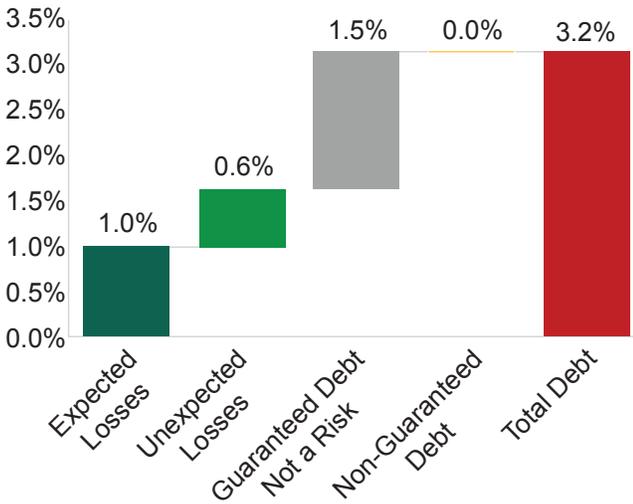
Figure 2. Risk impact matrix II

Potential Size of Impact <sup>2</sup>	Large (>= 50 percent of guaranteed Loan)			
	Medium (>= 25 percent of guaranteed Loan)	P2: Transportation Company,	P1: Energy Utility,	
	Small (>= 0 percent of guaranteed Loan)			
		Low Risk and Moderate Risk	Elevated Risk	High Risk and In Distress
		Risk Rating		

Figure 3. Annual expected losses



**Figure 4. Breakdown of debt liabilities**



tool displays the level of the subsidies as the difference between the market value of the guarantee and the fee. The market value of the guarantee is calculated as a percentage of the present value of expected losses. This percentage is input by the users.

**Section I calculates the amount to be provisioned for potential losses.** Users are required to provide the share of expected losses as well as unexpected losses that is wished to be provisioned as a separate budget line item, budgetary contingency reserve or an extrabudgetary fund, and the tool calculates the corresponding provisions.

**Section J facilitates the monitoring of limits.** In this section users need to input desired limits on the stock of guaranteed debt of public corporations and on the maximum annual losses. The tool displays whether the limit was exceeded or not.

**Figure 5. Breakdown of debt liabilities per public corporation**



## IV. Theory Behind Credit Rating as a Risk Assessment Methodology

### a. Definition

**Credit risk refers to the risk that borrowers or counterparties fail to meet their financial obligations in accordance with agreed terms (Basel Committee on Banking Supervision, 2000).** In the context of this note and the corresponding analytical tool, credit risk stems from a public corporation's non-performance of (guaranteed or non-guaranteed) financial obligations to lenders<sup>28</sup> that result in a cost to the central government.

**Credit rating is a methodology to assess credit risk.**<sup>29</sup> Credit rating usually involves the rating or scoring of several risk factors that are specific to industries and aggregating these scores to a credit rating.<sup>30</sup>

**Credit ratings are risk rankings.** Ratings are usually expressed using letters, numbers, or a combination of both.<sup>31</sup> As rankings, credit ratings provide an assessment of an obligor's creditworthiness relative to the rated universe and are not absolute measures of risk. The assessment of creditworthiness is forward-looking, includes both an obligor's ability and willingness to meet financial obligations, and may reflect only the likelihood of an obligor meeting its financial obligations. Credit ratings can be assigned to issuers and their local or

foreign currency obligations. They can be long-term or short-term and expressed on a global or national scale.

**Credit ratings can be linked to default frequencies and probabilities.** Historical databases can track historical credit ratings and corresponding default events. With a consistent rating process, a sufficiently large dataset, and a time horizon that spans economic cycles, long-term average default frequencies per rating category should be relatively stable and increasing with higher risk ratings. Assuming a stable future relationship between credit ratings and default frequencies, average probabilities of default by rating category may be inferred from past default frequencies.

**Risk quantification is the translation of the outputs of a risk analysis into quantifiable measures, such as expected losses and market values.** These are generally easier to communicate to policy makers, facilitate the comparability of alternative policy measures and support planning. Bachmair (2016) and World Bank (2019) discuss the advantages and pitfalls of risk quantification in detail.

### b. International Experiences

**Credit rating is commonly used by financial institutions and governments to assess credit risk.** Users specifically include:

- **Rating agencies:** Rating agencies are the most prominent examples of institutions using credit rating to assign ratings to a wide range of institutions. Governments are often familiar with rating agencies from the perspective of being rated themselves. The three largest global rating agencies are

28. In the case of (on-)lending the central government itself is the lender.

29. Standard and Poor's provides a concise summary of their credit rating essentials at <https://www.spglobal.com/ratings/en/about/understanding-credit-ratings>.

30. (Bachmair, 2016) discusses credit rating as a risk assessment methodology for government risk managers.

31. For example, a comparison of the rating scales used by the three major international rating agencies, Fitch, Moody's, and Standard & Poor's can be found here: <https://www.moneyland.ch/en/rating-agencies>. Credit rating scales often distinguish between investment grades (lower risk) and non-investment or speculative grades (higher risk) and maintain and monitor ratings for obligors in default.

Fitch Ratings, Moody's, and Standard & Poor's. These rating agencies provide lots of information on their websites, including their rating criteria, definitions, and sector-specific or regional outlooks.

- **Financial institutions.** Banks' credit risk departments often rate borrowers and counterparties for setting exposure limits, pricing, deciding on individual lending operations, and calculating regulatory capital, including in accordance with the Basel Committee on Banking Supervision's internal ratings-based approach (Bank for International Settlements, 2020).
- **The World Bank Group.** The International Bank of Reconstruction and Development (IBRD) houses two credit risk management units both employing credit rating methodologies to assess the creditworthiness of governments borrowing from the World Bank as well as the creditworthiness of obligors IBRD invests its liquid asset portfolio in. Furthermore, the International Finance Corporation has developed rating methodologies to inform pricing and risk management for its lending and investment operations.
- **Governments.** Several governments have adopted rating methodologies to assess risks from public corporations, subnational governments, project companies in public-private partnerships (PPPs), and guarantees to these institutions. Examples include governments with a long history of risk management and high capacity, as well as governments that have recently embarked on reforms to strengthen risk management and more limited capacity (e.g. Colombia, Ghana, Indonesia, Mozambique, South Africa, Sweden, Thailand, and Uganda). The rest of this section provides insights about the implementation of various approaches in Ghana, Mozambique, South Africa and Thailand respectively.

**This analytical tool tries to bring together various perspectives in an efficient manner.** As it can be seen, the complexity of the adopted methodology varies across institutions and sovereigns. Thus, this

tool aims to provide a sound tool for the practitioners while balancing the degree of complexity.

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## Ghana

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Recognizing contingent liabilities from government credit guarantees and on-lending, Government of Ghana has included provisions for their management in its Public Financial Management Act (PFMA) 2016.<sup>32</sup>

The PFMA requires the Public Debt Management Office (PDMO) to "assess the local government authority, public corporation or other entity to ascertain the fiscal risk of that local government authority, public corporation or other entity to the Government in respect of that guarantee."<sup>33</sup>

To implement the PFMA, the PDMO developed guidelines for guarantees and on-lending as well as an internal credit risk assessment framework for the utility sector<sup>34</sup> with support from the World Bank.<sup>35</sup>

The credit risk assessment framework for the utility sector is codified in a methodology paper approached by the Minister of Finance and guides analysts in applying a credit rating methodology to assess the creditworthiness of prospective guarantee or loan beneficiaries.

The credit rating methodology includes key business risk and financial risk indicators; provides a description for each indicator<sup>36</sup>; assigns weights; offers scoring guidance; and defines a rating scale from A to C, as illustrated in the charts below.

Ratings are used to inform decision-making on the issuance of new guarantees or providing loans, the monitoring of risks, as well as the setting of risk-based guarantee fees.

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32. <https://www.mofep.gov.gh/economic%20reports/The%20New%20Public%20Financial%20Management%20Act%2C%202016%20%28PFMA%29%20Act%20921%20/2016-09-20>.

33. Similar provisions apply to government on-lending.

34. A significant share of the government's exposure is to public electricity and water utilities.

35. Support was provided under the Government Debt and Risk Management Program (<https://www.worldbank.org/en/topic/debt/brief/government-debt-and-risk-management-program>) and is featured in a blog at <https://www.worldbank.org/en/news/feature/2017/12/12/ghana-catalyzing-south-south-dialogue-for-managing-contingent-liabilities>.

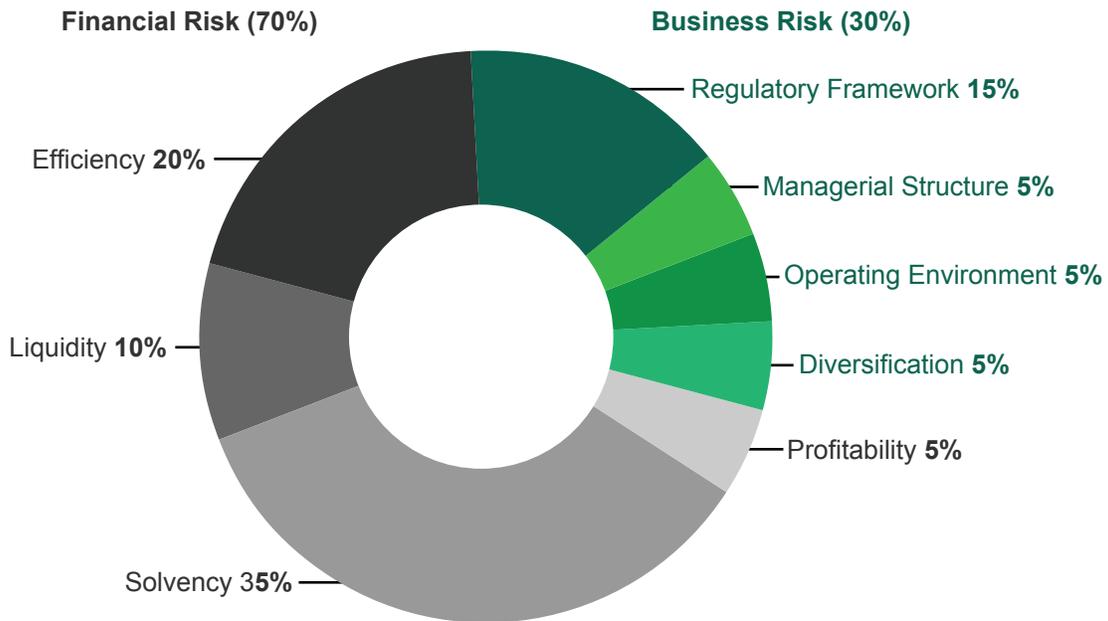
36. Including the rationale for including a specific indicator and how it is scored.

**Risk indicators used to rate utilities in Ghana**

Business Risk Indicators	Financial Risk Indicators
<ul style="list-style-type: none"> <li>• <b>Regulatory Framework</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Adequacy of enabling Act</li> <li><input type="checkbox"/> Rate setting flexibility</li> <li><input type="checkbox"/> Sufficiency of rates</li> <li><input type="checkbox"/> Independence of the regulator</li> </ul> </li> <li>• <b>Managerial structure</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Entity complying with established regulations</li> <li><input type="checkbox"/> Corporate Governance</li> <li><input type="checkbox"/> Reporting standards of annual reports</li> </ul> </li> <li>• <b>Operating environment</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Market share/type</li> </ul> </li> <li>• <b>Diversification</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Input sources</li> <li><input type="checkbox"/> Sources of income</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Profitability</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> EBITDA<sup>1</sup></li> <li><input type="checkbox"/> Revenue growth</li> </ul> </li> <li>• <b>Solvency</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Debt Service Cover Ratio</li> <li><input type="checkbox"/> Debt equity</li> </ul> </li> <li>• <b>Liquidity</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Current ratio</li> <li><input type="checkbox"/> Cash ratio</li> </ul> </li> <li>• <b>Efficiency</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Receivable days</li> <li><input type="checkbox"/> Revenue/assets</li> <li><input type="checkbox"/> Cost/income</li> </ul> </li> </ul>

<sup>1</sup> Earnings before Interest, Taxes, Depreciation, and Amortization.

**Weights assigned to risk indicators**

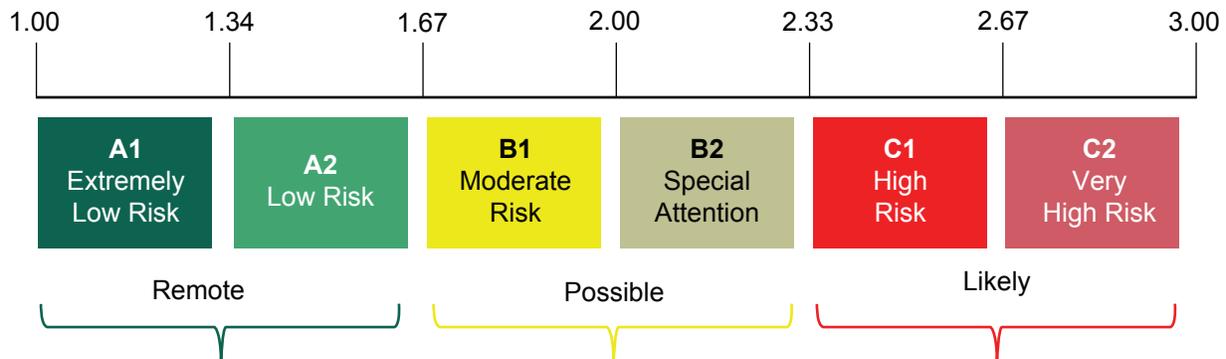


**Scoring guidance for financial risk indicators**

Risk Indicators	1_Strong	2_Fair	3_Weak
<b>Profitability</b>			
EBITDA	$X \geq 13\%$	$5\% < X < 13\%$	$X \leq 5\%$
Revenue	$X \geq 40\%$	$12\% < X < 40\%$	$X \leq 12\%$
<b>Solvency</b>			
DSCR	$X \geq 1$	$1 < X < 0.5$	$X \leq 0.5$
Debt/Equity	$X \leq 1$	$1.1 < X < 2$	$X \geq 2$
<b>Liquidity</b>			
Current Ratio	$X \geq 5$	$2 < X < 5$	$X \leq 2$
Cash Ratio	$X \geq 0.4$	$0.2 < X < 0.4$	$X \leq 0.2$
<b>Efficiency</b>			
Receivable Days	$X \leq 60$	$60 < X < 100$	$X \geq 100$
Revenue/Assets	$X \geq 33\%$	$20\% < X < 33\%$	$X \leq 20\%$
Cost/Income	$X \leq 49\%$	$49\% < X < 80\%$	$X \geq 80\%$

DSCR = Debt Service Coverage Ratio.

**Rating scale**



Source: Ministry of Finance, Ghana; Authors

**Mozambique**

Revelations of previously undisclosed debt in 2016 and high levels of borrowing by underperforming public corporations contributed to the country’s debt distress in recent years. In 2017, the Council of Ministers approved a decree to regulate the issuance and management of public debt and the provision of sovereign guarantees.<sup>37</sup> To implement the decree, the Government

of Mozambique developed risk assessment methodologies with support from the World Bank.<sup>38</sup>

In 2019, the Government prepared a credit risk analysis report for the public corporations’ sector. The report used Altman’s Emerging Market Score model (Altman, An emerging market credit scoring system for corporate bonds, 2005) to rate public corporations based on historical financial ratios.<sup>39</sup>

37. Decree 77/2017 ([http://www.salcaldeira.com/index.php/pt/publicacoes/artigos/doc\\_download/1061-decreto-n-78-2017-aprova-o-regulamento-do-reembolso-do-imposto-sobre-o-valor-acrescentado-e-revoga-o-decreto-n-77-98-de-29-de-dezembro](http://www.salcaldeira.com/index.php/pt/publicacoes/artigos/doc_download/1061-decreto-n-78-2017-aprova-o-regulamento-do-reembolso-do-imposto-sobre-o-valor-acrescentado-e-revoga-o-decreto-n-77-98-de-29-de-dezembro).)

38. The work was led by the Fiscal Risk Unit (Gabinete de Gestão de do Risco) at the Ministry of Finance and Economy.

39. The model is an extension of Altman’s 1968 model applying discriminant analysis to estimate Z-Scores (Altman, 1968).

$$EMS = 3.25 + 6.56 \times \frac{\text{Working Capital}}{\text{Total Assets}} + 3.26 \times \frac{\text{Retained Earnings}}{\text{Total Assets}} + 6.72 \times \frac{\text{EBIT}^{40}}{\text{Total Assets}} + 1.05 \times \frac{\text{Book Value Equity}}{\text{Total Liabilities}}$$

To allow for a more in-depth analysis of priority public corporations, the Government developed a credit rating methodology. The methodology is based on rating methodologies from Moody's for the respective industries the Mozambican public corporations operate in and adjusted for Mozambique-specific factors.

The methodology is codified in rating methodology paper approved by the Minister of Finance and guides analysts in rating public corporations. The methodology

provides a rating scorecard including qualitative and quantitative rating factors and weights (below), scoring guidance for each rating factor, as well as a rating scale (below).

The methodology has been approved in early 2020, applied to a sample of public corporations, and is intended to support decision-making for the granting of guarantees and possibly the approval of borrowing by public corporations, as well as regular risk monitoring.

### Rating scorecard

Quantitative		Qualitative	
Factor	Weight	Factor	Weight
Net Debt/EBITDA	20%	Regulatory environment	12.5%
CFO/Debt Service	15%	shareholders in the control of the Company	7.5%
Return on equity	10%	Market resilience	5%
Total Debt/Capital	7.5%	Quality and transparency of accounting information	5%
Exposure to foreign exchange risk	7.5%		
Conversion of EBITDA into cash	5%		
EBITDA growth in the last 3 years	5%		
<b>Subtotal</b>	<b>70%</b>		<b>30%</b>
<b>TOTAL 100.0%</b>			

### Rating scale

Score	Classification
1–2	Low Risk
2–4	Medium Low Risk
4–6	Medium Risk
6–8	Medium High Risk
8–10	High Risk

Source: Ministry of Finance and Economy, Mozambique; Authors.

40. Earnings before interest and taxes.

## South Africa<sup>41</sup>

The South African government is exposed to a range of contingent liabilities, including guarantees to public corporations. To manage risks from CLs, the National Treasury has created a Fiscal Liabilities Committee which is responsible for developing tools and policies to manage credit risk from guarantees, and to make recommendations to the Minister of Finance on the issuance of guarantees.

To assess credit risk from guarantees, the Credit Risk Directorate at the Asset and Liability Management Division of National Treasury has developed sector-specific

credit rating methodologies for the energy, aviation, infrastructure, transport, defense, and telecommunications sector, supported by the World Bank.<sup>42</sup>

Each methodology is codified in a methodology paper, including business and financial risk indicators (below), weights for each rating factor, scoring guidance for financial ratios (below), and a rating scale (below).

The ratings are used for regular risk monitoring and reporting, and to inform the decision-making on the issuance of new guarantees. Ratings are converted into probabilities of default as described in (Bachmair, Aslan, & Maseko, 2019).

## Risk indicators

Business risk Indicators	Financial risk indicators
<ul style="list-style-type: none"> <li>• <b>Industry Prospects</b> <ul style="list-style-type: none"> <li>• Operating environment</li> <li>• Regulatory framework</li> </ul> </li> <li>• <b>Corporate Governance</b> <ul style="list-style-type: none"> <li>• Adherence to applicable legislation</li> <li>• Management quality</li> </ul> </li> <li>• <b>Market Position</b> <ul style="list-style-type: none"> <li>• Diversification</li> <li>• Size (capacity)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Profitability</b> <ul style="list-style-type: none"> <li>• Revenue growth</li> <li>• Operating margin</li> <li>• Net profit margin</li> </ul> </li> <li>• <b>Debt capacity</b> <ul style="list-style-type: none"> <li>• Debt to assets ratio</li> <li>• Debt to equity ratio</li> <li>• Interest cover ratio</li> </ul> </li> <li>• <b>Efficiency</b> <ul style="list-style-type: none"> <li>• Cost to income ratio</li> </ul> </li> <li>• <b>Cash flow adequacy</b> <ul style="list-style-type: none"> <li>• Funds from operations to debt ratio</li> </ul> </li> <li>• <b>Liquidity</b> <ul style="list-style-type: none"> <li>• Cash ratio</li> <li>• Quick ratio</li> <li>• Current ratio</li> </ul> </li> </ul>

<sup>41</sup> The risk assessment and management approach for the energy sector is described in more detail in (Bachmair, Aslan, & Maseko, 2019).

<sup>42</sup> The engagement is described in a blog at <https://www.worldbank.org/en/news/feature/2018/06/19/south-africa-on-the-right-track-assessing-the-contingent-liabilities-from-state-owned-enterprises>.

## Risk ratings

Risk Ratings	Extent of risk exposure	Likelihood of materialisation
1	Extremely low risk	Remote
2	Low risk	
3	Moderate risk	
4	Marginal risk	
5	Special attention	Possible
6	Substandard	
7	High risk	Probable
8	Very high risk	
9	Eminent default/in default	

## Scoring guidance for financial ratios

Risk rating	1	2	3	4	5	6	7	8	9
Extent of exposure	Extremely low risk	Low risk	Moderate risk	Marginal risk	Special attention	Substandard	High risk	Very high risk	Eminent default/in default
Likelihood of materialization	Remote				Possible		Probable		
Credit rating	Aaa	Aa2	A2	Baa2	Ba2	B2	Caa2	Ca	C
<b>Profitability ratios</b>									
Revenue growth (%)	>15	15–13.1	13–11.1	11–9.1	9–7.1	7–5.1	5–3.1	3–1	<1
Net profit margin (%)	>25	25–22.1	22–19.1	19–16.1	16–13.1	13–9.1	9–5.1	5–1	<1
Operating margin (%)	>38	38–32.1	32–27.1	27–22.1	22–17.1	17–12.1	12–7.1	7–1	<1
<b>Debt capacity ratios</b>									
Debt ratio (%)	<15	15–25	26–36	37–47	48–58	59–69	70–80	80–90	>90
Debt to equity ratio (times)	<0.4	0.5–0.6	0.7–0.9	1	1.1–1.7	1.8–2.4	2.5–3.1	3.2–4	>4.0
Interest cover ratio (times)	≥8	7.9–6	5.9–4.5	4.4–3	2.9–2	1.9–1	0.9–0.7	0.6–0.5	<0.5
<b>Efficiency ratio</b>									
Cost to income ratio (%)	≤16	16–25	26–35	36–45	46–55	56–65	66–75	76–85	>85
<b>Cash flow adequacy ratio</b>									
Funds from operations to debt ratio (%)	≥40	40–36	35–31	30–23	22–18	17–14	13–10	9–6	≤5
<b>Liquidity ratios</b>									
Cash ratio (times)	≥1.0	0.99–0.93	0.92–0.85	0.84–0.8	0.7–0.6	0.5–0.4	0.3	0.2	≤0.1
Quick ratio (times)	≥4.0	3.9–3.2	3.1–2.8	2.7–2	1.9–1.3	1.0–0.5	0.4	0.3–0.2	≤0.1
Current ratio (times)	≥5.5	5.5–4.5	4.4–3.5	3	2.0	1.0	0.9–0.6	0.5–0.2	≤0.1

Source: National Treasury of South Africa; Authors.

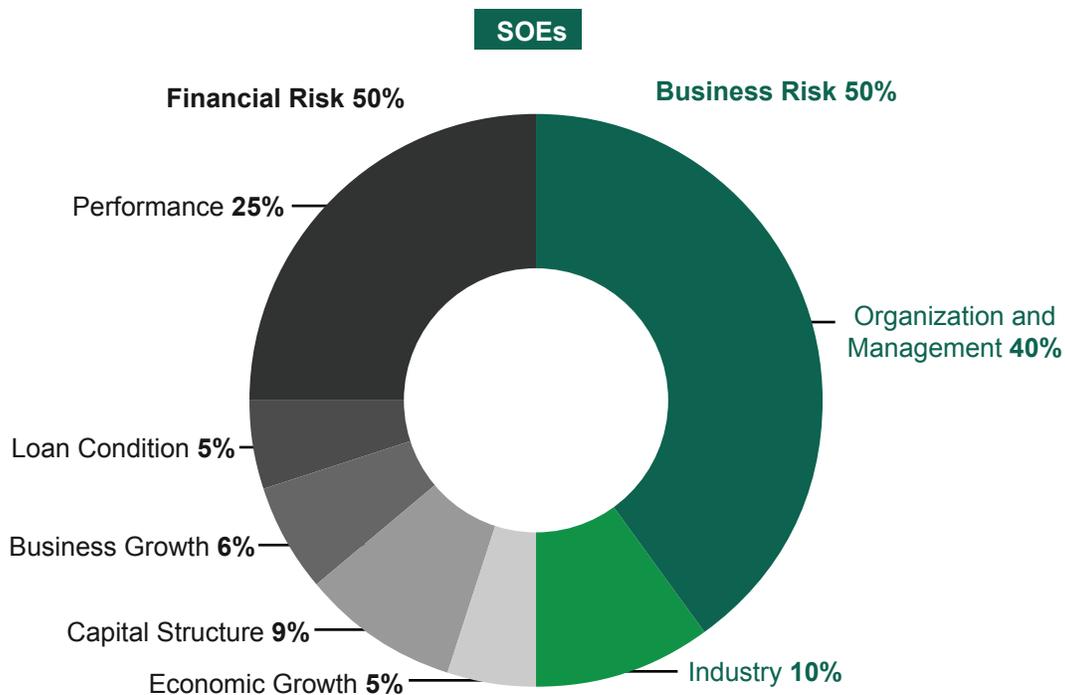
## Thailand<sup>43</sup>

The Government’s fiscal risks include contingent liabilities from guaranteed and non-guaranteed debt from public corporations, as well as on-lent loans to public corporations. The Ministry of Finance is charged with managing contingent liabilities. Units involved include the State Enterprise Policy Office, the Fiscal Policy Office and the Public Debt Management Office (PDMO). Based on its mandate in the Public Debt Management Act 2005 and ministerial regulation and notifications, the PDMO is using a credit rating model to support its recommendations on the issuance of guarantees, to set guarantee fees, and to monitor risks. Following a standardized credit rating process (below), the PDMO employs distinct credit rating models for non-financial and financial public corporations, both using business risk and financial risk indicators (below), to arrive at a credit rating for each public corporation on a scale of eight numerical ratings (below).

### Credit rating process

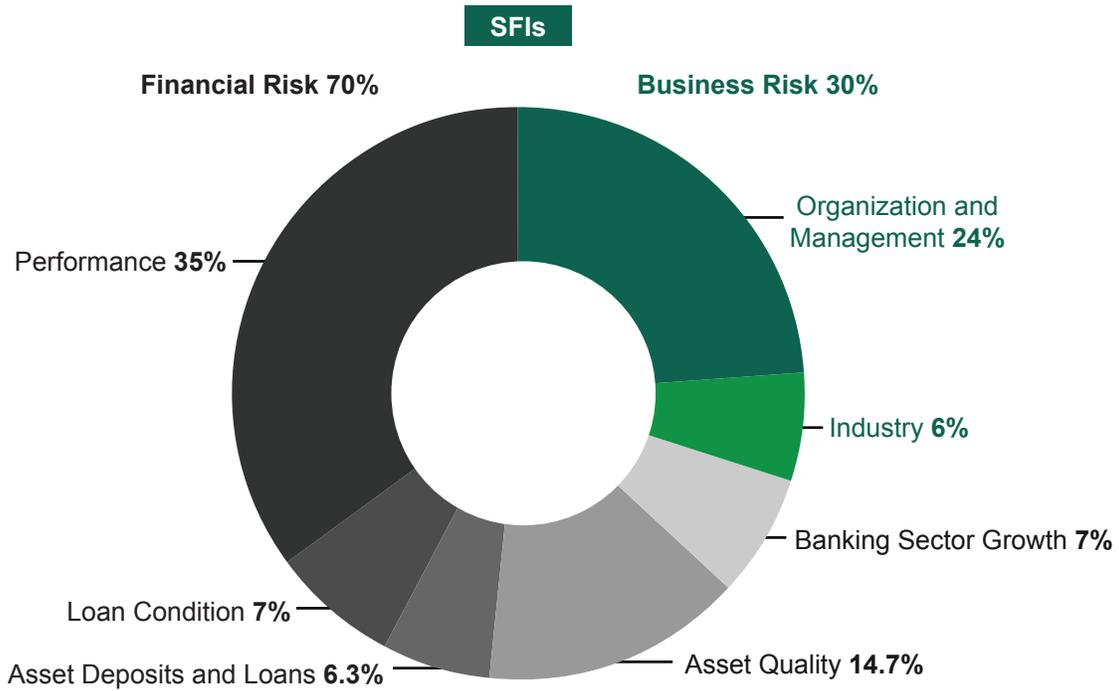


### Credit rating models for non-financial and financial public corporations



43. Thailand's practices with respect to assessing and managing risks from government guarantees are also described in (World Bank Treasury, 2019).

**Credit rating models for non-financial and financial public corporations (Continued)**



SOEs: State-Owned Enterprises, SFIs: State Financial Institutions

**Rating scale**

Rating	Definition	Risk of Default
8	LOSS	Very High
7	DOUBTFUL	High
6	SUB-STANDARD	Low
5	WATCH	
4	ACCEPTABLE	
3	STRONG	Very Low
2	VERY STRONG	
1	PRIME	

High Risk  
↑  
Low Risk

Source: Public Debt Management Office, Thailand; Authors.

### c. Rationale for Use of Credit Rating Methodology

Apart from credit rating, governments, financial institutions, and academics use a range of alternative credit risk assessment approaches and methodologies. (Allen & Alves, 2016), (Bachmair, 2016), (Razlog, Irwin, & Marrison, 2020), (Saxena, 2017) and (World Bank Treasury, 2019) describe alternative approaches in the context of public corporations and government guarantees, and discuss their respective advantages and disadvantages.<sup>44</sup> Approaches and methodologies include expert judgement, the extrapolation of historical relationships and trends, statistical models, scenario analysis, structural models, simulation models, and the use of market prices.

**Relative to other methodologies, credit rating is intuitive and flexible.** The approach of scoring qualitative and quantitative risk factors and aggregating scores to an overall rating of an entity, expressed in letter or numerical ratings, is easy to understand for a non-technical audience and hence facilitates communication to senior management, policymakers, and the public. Policymakers are often already familiar with the credit rating approach from the experience of rating agencies rating the sovereign. Credit rating is flexible in that it allows users to define the rating factors for each type of entity (e.g. public corporations, subnational governments, etc.) and sector, how to score them, and their respective weights. Credit rating does not rely on a rigid and mechanical mathematical model. Hence, it is analytically also less demanding than some other approaches. As shown in this guidance note and the references to publications by rating agencies, a wealth of third-party information is available to help government risk managers in developing tailored methodologies and building capacity. The intuitive and analytically less demanding nature of credit rating has resulted in several governments with little credit risk management experience, constrained resources, and limited capacity

to start with credit rating when embarking on risk management reforms.

**Credit rating, however, requires an understanding of the fundamentals of rated entities and additional data to translate risk rankings into more quantified measures.** The absence of a model or an equation that provides unambiguous outputs based on mechanical input of data requires analysts to apply judgement and to develop a deeper understanding of the key risk drivers for each type of entity and sector, as well as the entities themselves. The application of judgement involves subjectivity which can be managed through a well-defined rating process that ensures analysts' ratings are challenged in a committee-process (Section IV.d). The outputs of a credit rating approach are ordinal risk ratings (rankings). As such, they do not provide a risk measure that can be expressed in absolute terms. To further quantify risks, additional data is required.<sup>45</sup>

**Credit rating and scenario analysis offer distinct advantages and complementarities.** Similar to this guidance note and accompanying analytical tool, the World Bank published a scenario analysis tool and guidance note outlining an alternative methodology to assess and quantify risks from government guarantees (Razlog, Marrison, & Irwin, 2020). Government risk managers can review the respective methodologies, including the inputs required, the analysis undertaken, and the outputs provided, before choosing among them. Scenario analysis can also be used complementary to credit rating, for example to assess the severity of losses in specific scenarios, and to apply a common set of stress scenarios across a portfolio of entities or projects.

### d. The Rating Process

**Credit ratings should be assigned following a formalized process.** The rating process ideally encompasses (an) approved rating methodology paper(s), terms of

<sup>44</sup> See, for example, table 9 on p. 85 of (World Bank Treasury, 2019) and Annex 1 on p. 30 of (Razlog, Marrison, & Irwin, 2020).

<sup>45</sup> Sections V.c through V.f illustrate how the analytical tool translates credit ratings into probabilities of default/distress using historical default rates and then calculates expected and unexpected losses.

**Table 3. Moody's rating process**

<b>Step 1</b>	<b>Analytical team is assigned upon execution of commercial engagement:</b> Once the rating application is contracted, the Moody's analytical team is assigned.
<b>Step 2</b>	<b>Issuer shares company information with analytical team:</b> The issuer prepares their company information and presentation for the first meeting with the Moody's analytical team.
<b>Step 3</b>	<b>Management meeting with analytical team:</b> The issuers management team meets with the Moody's analytical team to present the company information and discuss the materials. This phase may be accelerated in situations with tighter financing schedules, or for structured finance deals.
<b>Step 4</b>	<b>Analytical team commences analysis and goes to rating committee:</b> The rating committee is a key part of Moody's analytical process and helps to ensure the integrity and consistency of ratings. It reviews, votes and assigns the rating. After the rating committee, a post-committee call is held with the issuer to notify and explain the rating prior to its publication.
<b>Step 5</b>	<b>Ratings and rationale are delivered:</b> The issuer reviews the draft press release. The rating is then delivered through a press release available on moodys.com and newswires.
<b>Step 6</b>	<b>Ongoing monitoring:</b> Surveillance and dialogue are maintained with organizations for timely and relevant ratings.

Source: Moody's (2022).

reference for a rating committee, and the requirement for rating reports to detail ratings and rationales for ratings assigned. Table 3 illustrates the rating process followed by Moody's<sup>46</sup>.

**When applied to ratings of public corporations by government risk managers, Step 1 is likely to be replaced by a statutory requirement or a public corporation's request** for government support that triggers the requirement of risk assessment. Step 5 may be more focused on the interaction between the institutional unit assigning a rating and the institutional units using ratings to inform policy decisions (e.g. the rating may be submitted to an advisory committee and/or the Minister of Finance). In most cases, the government would not publish its credit risk assessment of another public sector unit. To implement a sound rating process, the technical nature of it should be safeguarded against unduly political interference and analysts require sufficient capacity to undertake the analysis and rate entities.

**Rating methodology papers provide guidance to analysts and support the consistent application of criteria across rated entities and over time.** Governments cited in Section IV.b have codified their approaches in formally approved methodology papers. Approval is usually provided by a senior civil servant within the Ministry of Finance or the Minister of Finance. Methodology papers ideally define the scope of the respective methodology (e.g. types of entities and sectors they apply to); provide clear guidance to analysts on the rating factors used and how they are scored and weighted; the process for revising methodologies on a regular basis (e.g. every three years); and how ratings will be used to inform policy decisions.

**Rating committees should be set up to strengthen the quality of analysis and to manage subjectivity.** The use of rating committees is standard practice at financial institutions, including the World Bank, and rating agencies. The terms of reference of rating committees should include its responsibilities (e.g. when and for what purposes it is convened, who it reports to, what outputs it produces); membership (e.g. clarifying institutional representation, the chairperson, the use of external (sector or methodological) experts); the process

46. <https://ratings.moodys.io/ratings#rating-process>. For other rating agencies, refer to: Fitch and for Standard and Poor's, see: Standard and Poor's.

of assigning ratings (e.g. analysis to be prepared by analysts before the committee convenes); the system of voting (e.g. voting rights of committee members, quorum, sufficient majorities, dissent); and reporting. The rating committee should be used as a technical forum to challenge assumptions made, mitigate potential biases of individuals, and gather a range of perspectives.

**Analysts and committees should also be guided in how to deal with insufficient or imperfect information.** Experience shows that information and data required to perform credit ratings may be of insufficient quality or unavailable altogether. Often, missing information may be credit-negative, indicating a public corporation's interest in not disclosing risks, or an inability of management to produce timely and accurate reports. Government policy could be not to assign ratings if it deems the required information to provide an accurate assessment to be missing. This could result in a public corporation's ineligibility for support, thereby raising incentives of management to provide the necessary information. At other times, the rating methodology and rating committee terms of reference may provide guidance to supplement missing information with expert judgement, by providing additional weight to other rating factors, or by assuming the worst rating in the rating scale for a specific rating factor that cannot be assessed.

**Rating reports help document the analysis performed and support accountability and transparency.** Rating reports should include an overall rating and how the rating committee arrived at a rating based on the scores assigned to individual rating factors. Additionally, the rating report can include a summary of a government's risk exposure and relationship with the public corporation, and any recommendations for risk management measures based on the assigned rating (Box 1). Rating reports that make a risk assessment explicit raise the accountability of policymakers when assuming contingent liabilities, and help undertake revisions of rating methodologies based on their historical performance.

**Performing sound analysis requires continuous capacity building.** Institutional arrangements should ensure staff are dedicated to performing credit risk analysis, thereby allowing them to build up capacity over time. Capacity should be built through staffing based on educational and previous experience, on-the-job learning, e.g. from the application of the credit rating methodologies and discussions in rating committees, desk research and learning from international experiences, as well as formal training.<sup>47</sup> Relevant backgrounds and experience include accounting, economics, financial analysis, economics, and risk management.

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47. The World Bank offers a course on "Assessing and Managing Risks from Contingent Liabilities" as part of its capacity building offerings on fiscal risk management (<https://www.worldbank.org/en/programs/debt-toolkit/fiscal-risk>).

## **Box 1. Illustrative outline of a rating report**

Name of rated company, analyst preparing report, date of report

### **Profile of company**

- Very brief description of sector company operates in, business model (e.g. breakdown of revenues and costs, funding structure, diversification of asset base, etc.), and competitive position (e.g. market share)

### **Relationship with government and potential exposure**

- Shareholdings; guarantees outstanding; (on-)lending
- Financial flows between public corporation/subnational government and central government (e.g. track record of transfers, subsidies, dividends, taxes, capital transfers, regular or extraordinary support)
- Debt service obligations in short- and medium-term
- Any receivables/payables (including arrears) between the public corporation and central government and other public corporations

### **Risk assessment**

- Assigned credit rating (including evolution over recent years)

### **Recommendation**

- Actions recommended to improve public corporation
- Recommendation whether to grant a guarantee/loan request or not (if rating undertaken for the purpose of informing a decision on a guarantee or borrowing request)
- Other risk mitigation measures (such as fees or limits)

### **Key findings**

- Highlights of macroeconomic, industry-, and company-specific developments that inform the rating

### **Outlook**

- Assessment of recent trends and likely evolution of company's creditworthiness

### **Detailed risk assessment**

- Scores on individual business and financial profile indicators
- Rationale for scores assigned for each rating factor
- Disclosure of information used to arrive at assessment (e.g. financial statements)

## V. Appendix

### a. Worksheet “Input\_checklist”

#### 1. General Inputs

- a. Nominal GDP forecasts for 45 years

#### 3. Rating Scorecard

- a. Background information to qualitatively assess the following factors:

Regulatory Environment

Sector Risk and Competitive Position

Governance and Management

Debt Structure

Performance in Meeting Financial Obligations to Government

- b. Historical (two years) and projected figures (four years) for the following financial ratios:

EBITDA Margin

ROA

Current Ratio

Quick Ratio

Debt to Equity

Debt Coverage Ratio

#### 4. Matching Credit Ratings

- a. Sovereign Rating
- b. Country Ceiling

#### 5. Risk Quantification

- a. Information related to relevant debt liabilities of each public corporation
  - Disbursed debt outstanding
  - Annual principal payments
  - Weighted average interest rate

Share of guaranteed or on-lent debt (principal and interest) out of total debt

Discount rate

Expected recovery rate (base-case and stress-case)

This is not an exhaustive list of all the inputs required by the analytical tool. The list only includes the factual inputs that users need to procure from external sources and excludes subjective inputs that will be based on users' expert judgement or prior experiences.

### b. Matching Credit Ratings in Low Rated or Defaulted Countries

For lower sovereign ratings, there are more limited options for users to distribute public corporations' credit ratings evenly and/or distinctly. This might hamper efforts to differentiate the credit risks of the entities in a transparent way.

The lowest sovereign rating where each credit rating could be matched to a distinct credit score is Caa1, where matching would be as follows:

- Low Risk to Caa1 (same as the sovereign),
- Moderate Risk to Caa2,
- Elevated Risk to Caa3,
- High Risk to Ca-C.

For sovereign ratings equal to or below Caa2, it is not possible to match the four different credit ratings to

distinct categories. Under such a scenario, users have several alternatives:

- 1) Keep the sovereign rating as the cap and compress the rating by matching more than one credit rating to a single credit score. This is the standard approach followed by the global rating agencies and the recommended approach. For example:
  - Low Risk to Caa2 (same as the sovereign),
  - Moderate and Elevated Risk to Caa3,
  - High Risk to Ca-C

In this example, the probabilities of default/distress of Moderate and Elevated Risk public corporations would be the same. Users can choose matching combinations different from the above example (for example equalizing Low and Moderate Risk with the sovereign, or equalizing Elevated and High Risk, etc.).

- 2) Keep the sovereign rating as the cap, but differentiate the credit risks of the different credit ratings by manually applying a multiplier to the probabilities of default/distress of the credit ratings that are matched to the same credit score. For example, users could firstly select the following matching in the worksheet “4. Matching Credit Ratings”:
  - Low Risk to Caa2 (same as the sovereign),
  - Moderate and Elevated Risk to Caa3,
  - High Risk to Ca-C.

In the second step, in the worksheet “5. Risk Quantification”, users could differentiate the probabilities of default/distress of Moderate and Elevated Risk entities, by multiplying the probabilities of the Elevated Risk entities by a multiplier of their choice based on judgment (for example 1.1x, 1.3x.,1.7x, etc.). In this example, users need to make sure that the overall probability of default/distress for Elevated Risk entities is not higher than that for High Risk entities.

- 3) Do not keep the sovereign rating as the cap. Instead match credit ratings (keep the number to

the minimum) to credit scores above the sovereign rating. For example:

- Low Risk to Caa1,
- Moderate Risk to Caa2 (same as the sovereign),
- Elevated Risk to Caa3,
- High Risk to Ca-C.

Under this approach, the lower the sovereign rating, the larger the distance between the credit scores of the public corporations and the sovereign. This increases the chances of underestimating the credit risks of public corporations, particularly in the context of a worsening sovereign rating, and given the high correlation between their probabilities of default/distress. Therefore, extreme caution and close monitoring, as well as a clear documentation and justification would be needed, should the users opt for this scenario.

In the case of a sovereign that is in default or gets into default (for which the Moody’s credit score would be D) it is likely that the government will stop issuing guarantees or receive funds for on-lending, therefore the analytical tool will no longer be applicable until the sovereign rating is upgraded. However, as long as the public corporations remain in a non-default state, users might want to use the analytical tool to continue to assess and differentiate their credit risks for other purposes (monitoring, reporting, etc.). In this case, either of the above three approaches could be followed with slight modifications as follows:

- 1) Match all credit ratings to Ca-C and do not differentiate the credit risks of the public corporations. This would be the recommended and the most similar approach to the global rating agencies’ approach.
- 2) Firstly, match all credit ratings to Ca-C in the worksheet “4. Matching Credit Ratings”, and secondly, manually apply a multiplier to the probabilities of default/distress in the worksheet “5. Risk Quantification” to differentiate the probabilities of default/distress of the public corporations with different credit ratings.

3) Match credit ratings to credit scores above the sovereign rating as follows:

- Low Risk to Caa1,
- Moderate Risk to Caa2,
- Elevated Risk to Caa3,
- High Risk to Ca-C.

This would be the least conservative approach and should be followed with extreme caution.

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### c. **Worksheet “7. PD (Default and Distress)”**

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The worksheet “7. PD (Default and Distress)” is where the probabilities of default (*Option 1*) or distress (*Option 2*) are assigned to the five different categories of credit ratings of the tool. The difference between the terms ‘default’ and ‘distress’ derives from the two alternative distress scenarios (*Option 1* and *Option 2*) that are defined in Section III.a. The worksheet consists of two sections, which show annual probabilities of default and distress separately:

- A. Probability of Default
- B. Probability of Distress

**No user inputs are required on this worksheet.** The annual probabilities of default/distress are assigned to credit ratings based on information in four separate worksheets of the analytical tool: i) “4. Matching Credit Ratings”, ii) “9. PDs – Distress Option 1”, iii) “10. PDs – Distress Option 2”, iv) “11. PDs – In Distress”. In the latter three, annual probabilities are calculated for the whole range of credit scores of Moody’s scale and for each of the two options. These probabilities are then linked to the credit ratings based on the matching done by the user in worksheet “4. Matching Credit Ratings”.

**Probabilities of default/distress are not only a type of quantified risk measure in themselves, but also**

**are used for further risk quantification (such as the calculation of expected and stressed losses).** They are used to infer the likelihoods that public corporations experience a (or remain in) distress over a given period, whereby they are unwilling or unable to repay (part or all) of their debt liabilities to the respective creditors.

**Probabilities of default and distress are intricately linked to the users’ choice of distress event.** For each of the two types of distress event defined in the worksheet “1. General Inputs”, the analytical tool provides annual probabilities of default or distress for each of the five credit ratings and all years<sup>48</sup>. The calculation and interpretation of these annual probabilities differ according to the chosen distress event. Under *Option 1*, the possibility of default each year is conditional upon the public corporation not having defaulted in the previous year (i.e. a public corporation can only default once). Hence, to arrive at cumulative probabilities of default, users can simply sum up annual probabilities of default up to and including the respective year.<sup>49</sup> As a result, the sum over any period may not exceed 100 percent<sup>50</sup>. Under *Option 2*, however, this is not the case. Distress may occur each year irrespective of whether distress has occurred the previous year(s). Hence, cumulative probabilities of distress cannot be arrived at through summation.

**The analytical tool uses a methodology based on a rating agency’s historical rating migration data to infer probabilities of default/distress, but these can be derived in other ways too.** Other common methods include using rules of thumb or internal historical databases. Following rules of thumb, users could distribute probabilities across the rating spectrum based on judgement and intuition.<sup>51</sup> Internal historical databases can be used to calculate distress frequencies per rating

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48. The analytical tool extends to 45 years. However, users only have to define probabilities of distress up to the year in which all public corporation debt has been repaid.

49. For example, under *Option 1*, if the probability of default is 5 percent in year 1, 4 percent in year 2, and 3 percent in year 3, respectively, the three-year cumulative probability of default equals 12 percent.

50. Under *Option 1*, the probability of default for public corporations rated “In distress” is 100 percent for the first year, and all future annual probabilities of default are 0.

51. For example, 5 percent for low risk; 20 percent for moderate risk; 40 percent for elevated risk; 60 percent for high risk; 100 percent for in distress.

and infer future probabilities for each rating.<sup>52</sup> However, few governments may have the required historical data.

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## d. Worksheet “8. Migration Rates”

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The “8. Migration Rates” worksheet consists of two sections that have the input required for the calculation of probabilities of default and distress in the next three worksheets (no user inputs are required on this worksheet):

- A. Moody’s Migration Rates
- B. Migration Rates Incorporating Ability to Migrate Out of Distress

Section A shows Moody’s average historical one-year migration rates across all the alpha-numerical credit scores in its rating scale for the period 1983–2017.<sup>53</sup> For example, out of 100 corporations rated AAA in a given year, approximately 87 were still rated AAA the following year. Approximately five were rated Aa1 (a downgrade of one notch), two were rated Aa2 (a downgrade of two notches), and one was rated Aa3 (a downgrade of three notches). The table shows that the likeliest outcome is for corporations’ rating to remain unchanged from one year to the next. Further, the frequency of up-/downgrades decreases with their magnitude. Each year, a number of ratings are withdrawn (WR; column W) and the frequency of withdrawals tends to increase with declining credit quality. As expected, the frequency of defaults (column X) also increases with declining credit quality.

Consistent with its definition of default<sup>54</sup>, Moody’s rating migration table does not allow for the possibility

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52. This requires adequate historical information of distress and non-distress events and credit ratings prior to distress events. Turkey is an example where the government had collected sufficient historical information to calibrate such a model as discussed in (Bachmair, 2016).

53. The data is publicly available in Exhibit 29 of the rating agency’s annual default study for corporate default and recoveries for 1920–2017, which can be accessed at Moody’s with a free subscription. Moody’s published updated studies subsequent to the version used in the analytical tool. Users could consult Moody’s website, should they wish to use more recent figures. Other rating agencies also publish information on historical default events. An example from Standard & Poor’s and Fitch can be found at Standard & Poor’s and Fitch.

54. Discussed here: Moody’s.

of corporations migrating from a default state to a non-default state.<sup>55</sup> This is consistent with default under *Option 1* of the analytical tool but not distress under *Option 2*.<sup>56</sup> According to the definition of distress under *Option 1*, a default triggers the acceleration of debt and a government payment of all (implicitly or explicitly) guaranteed debt to the creditor. Hence, a public corporation would only default once on a given debt liability.

However, according to the definition of distress under *Option 2*, a public corporation may experience distress in any given year irrespective of whether it has experienced distress in the previous year or not. Box 2 illustrates such a case for a 2-year time horizon.

Section B of the worksheet makes an adjustment to Moody’s average one-year migration rates to account for this difference between *Option 1* and *Option 2*. In the last row, “Default” is added as a state a public corporation can migrate from. The associated migration rates from “default” are based on the insight that most corporates’ rating remains unchanged from one year to the next and that the frequency of rating upgrades decreases with the magnitude of the upgrade. Specifically, for public corporations that are in “default”, it is assumed that 85 percent will remain in “default”. To tailor the analytical tool, users may assume different migration rates, for example, based on a government’s own historical experience with respect to the persistence of public corporation distress over time.

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## e. Worksheet “9. PDs Distress – Option 1” and Worksheet “10. PDs Distress – Option 2”

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In worksheets “9. PDs – Distress Option 1” and “10. PDs – Distress Option 2”, one-year migration rates are converted into migrations rates over the 45-year

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55. Hence, in section A, “default” is only shown on the x-axis (listing the states ratings can migrate to) but not the y-axis (listing the states ratings can migrate from).

56. Hence, the analytical tool uses Moody’s rating migration rates without making any adjustments to calculate probabilities of default for *Option 1*, while adjustments are made for *Option 2*.

### Box 2. Possible migration between Non-distress and Distress under Option 2

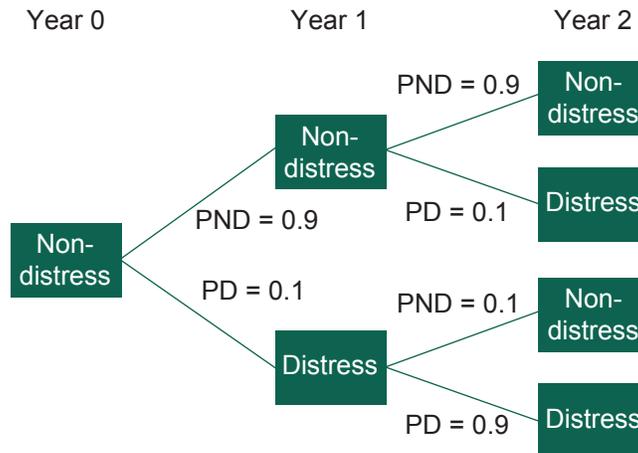
The example is a public corporation that is not in distress initially (year 0). In year 1, the public corporation may experience distress (at a 10 percent probability) or not (at a 90 percent probability). A public corporation in distress in year 1 may again experience distress in year 2 (at a 90 percent probability) or not (at a 10 percent probability).<sup>57</sup>

Therefore, under *Option 2*, a public corporation may migrate to a distress event in year 2 along two alternative paths:

Non-distress in year 0 -> Non-distress in year 1 -> Distress in year 2, or

Non-distress in year 0 -> Distress in year 1 -> Distress in year 2.

Hence, the annual probability of distress in year 2 equals 18 percent ( $0.9 \times 0.1 + 0.1 \times 0.9$ ).



where,

PD = probability of distress

PND = probability of non-distress

The same logic can be used to extend the time horizon beyond 2-years. The possible migratory paths proliferate as the period lengthens. For example, over a 3-year time period, public corporations could follow 4 distinct paths to migrate to a distress event (ND-D-D-D; ND-ND-ND-D; ND-ND-D-D; and ND-D-ND-D).

57. The corresponding probabilities (90 percent probability of remaining in distress and 10 percent probability of recovering from a distress event) are consistent with a view that a public corporation in distress may find it difficult to recover, assuming distress events are driven by structural issues rather than short-term financial problems.

**horizon.** In both worksheets there are five tables titled “Implied Rating Migration Rates” for five different initial ratings: i) for each of the four rating categories (Low Risk, Moderate Risk, Elevated Risk and High Risk), and ii) for the user-selected stress scenario rating required for the calculation of stressed losses in the “5. Risk Quantification” worksheet. No user inputs are required on these worksheets.

**The tables show the frequency (probability) of an initial rating staying the same or migrating to any other rating in Moody’s scale over the next 45 years.** For the first year (column 1), the migration rates are equivalent to those in the “8. Migration Rates” worksheet for the initial rating<sup>58</sup>. For example, the frequency of an initial rating of Ba2 remaining unchanged at Ba2 after a year is almost 64 percent, while its frequency for upgrade to Ba1 or downgrade to Ba3 is 8 or 7 percent, respectively. The calculation of the migration rates from the 2nd to the 45th year is explained in Box 3. In this case, the figures show the frequency of migrations independent of the level of rating in the previous year, for a given initial rating. For example, for an initial rating of Ba2, the frequency of the rating being Ba2 is almost 42 percent in year 2, independent of its level in year 1 (i.e. the rating starting off at Ba2 in year 0, either remaining the same at Ba2 or being upgraded or downgraded to any other rating on the scale in year 1, and returning to Ba2 in year 2). The frequency of the rating being Baa3 in year 2 is around 6 percent, regardless of the path it followed.

**The tables also provide the annual frequency of an initial rating migrating to default over time (along with the other ratings).** These constitute the probability of default/distress for that rating and feed the probabilities in worksheet “7. PD (Default and Distress)” for distress events *Option 1* and *Option 2* separately. When calculating annual default frequencies, the analytical

tool adjusts them for previous withdrawals.<sup>59</sup> Without the adjustment the annual default frequencies would be underestimated, as rating withdrawal would be assumed to be non-default events.

**The analytical tool’s methodology to derive the probabilities of default/distress is based on various assumptions and the results should be interpreted with caution.** For example, Moody’s underlying database is weighted towards corporates in advanced economies. The analytical tool, however, may more often be used in middle- and low-income countries. Furthermore, the database includes mostly private corporations while the analytical tool is focused on public corporations. The database includes ratings for the time period 1983 to 2017, however, default frequencies in future years may be different from those observed in the past. Lastly, the matching of Moody’s alpha-numerical credit scores with the credit ratings of the analytical tool is subjective and judgement-based.

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## f. Worksheet “11. PDs – “In Distress””

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**For the specific case of a public corporation being rated “In distress” initially, probabilities of default/distress for distress events *Option 1* and *Option 2* are shown in worksheet “11. PDs – “In Distress””.** By definition, the analytical tool assumes that the probability of default/distress such an entity is 100 percent in year 1.

**Under *Option 1*, all future probabilities of default are 0, since a public corporation can only default once on a given debt liability.** Under *Option 2*, future probabilities of distress are calculated using the methodology described in Sections V.d and V.e.

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58. Tables in “9. PDs Distress – Option 1” and “10. PDs Distress – Option 2” are linked to section A and section B of “8. Migration Rates”, respectively.

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59. Unadjusted annual default frequencies are divided by one minus the sum of rating withdrawals up to the previous year (see, for example, row 39 and in “9. PDs – Distress Option 1” and “10. PDs – Distress Option 2”). A more detailed discussion of the adjustment of default rates for rating withdrawals is published here: <https://www.moodys.com/sites/products/defaultresearch/2006200000425249.pdf>.

### Box 3 Calculation of implied rating frequencies for an initial rating Ba2

For an initial rating Ba2, this box shows the calculation of the frequency with which the rating is Ba2 after two years regardless of the path it followed.

First, the frequency of each possible rating (column 1) after one year is shown (column 2). This data is sourced from “8. Migration Rates”. Second, the frequency with which a rating migrates to Ba2 in the second year given any rating in the first year is calculated (column 3). The migratory paths from Ba2 initially to Ba2 after two years are many. A corporation could migrate from Ba2 to AAA and back to Ba2, from Ba2 to Aa1 and back to Ba2, etc. The fourth column in the table below shows frequencies of all migratory paths. These sum up to 41.5, i.e. of 100 corporations rated Ba2 initially, about 42 are rated Ba2 at the end of year 2. The analytical tool performs the same calculations as shown in the table below for all possible permutations over a 45-year period using SUMPRODUCT formulas to advance one year at a time.

Initial rating		Ba2	
Rating after 1st year (1)	Migration rates to ratings after 1st year (2)	Migration rates from respective ratings after 1st year back to Ba2 rating (3)	Frequency of migratory path (4 = 2 × 3)
AAA	0.00%	0.01%	0.00%
Aa1	0.00%	0.00%	0.00%
Aa2	0.02%	0.02%	0.00%
Aa3	0.03%	0.03%	0.00%
A1	0.09%	0.13%	0.00%
A2	0.12%	0.14%	0.00%
A3	0.17%	0.16%	0.00%
Baa1	0.39%	0.36%	0.00%
Baa2	0.72%	0.66%	0.00%
Baa3	3.81%	2.17%	0.08%
Ba1	7.91%	5.09%	0.40%
Ba2	63.59%	63.59%	40.43%
Ba3	6.82%	6.63%	0.45%
B1	3.80%	2.88%	0.11%
B2	1.34%	0.68%	0.01%
B3	0.95%	0.22%	0.00%
Caa1	0.33%	0.13%	0.00%
Caa2	0.22%	0.06%	0.00%
Caa3	0.09%	0.04%	0.00%
Ca-C	0.14%	0.15%	0.00%
WR	8.78%	0.00%	0.00%
Default	0.71%	0.00%	0.00%
<b>TOTAL</b>			<b>41.50%</b>

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