LONG TERM FISCAL PLANNING TOOL

PLATEAU STATE PUBLIC PRIVATE PARTNERSHIP SUPPORT

THE PLATEAU STATE INFRASTRUCTURE AND REGULATORY AGENCY 2024

Plateau State Infrastructure and Regulatory Agency
The assignment aims to increase private investment in the Plateau State infrastructure market across sectors and sustain this participation over an extended period.

Long-Term Fiscal Planning (LTFP) Tool Manual
This manual guide user of the LTFP Tool, an Excel-based tool for managing Fiscal Commitments and Contingent Liability (FCCL).

Acknowledgments
The Reigns Management Limited (RMCL) Team extends its gratitude for the input and guidance provided by those consulted and representatives from the Client and Plateau State Government (PLSG).

Opinions and Limitations
Unless explicitly stated otherwise, the opinions expressed herein are solely those of the authors and do not necessarily represent the Client's views. While RMCL endeavors to validate data obtained from third-party sources, the accuracy of such data cannot be guaranteed.

Confidentiality Statement
This Interim Report contains sensitive and confidential information. Prior written approval from the client is required before sharing it with third parties.

Table of Contents

Acronyms

Acronym	Definition
CBN	Central Bank of Nigeria
FCCL	Fiscal Commitments and Contingent Liabilities
GDP	Gross Domestic Product
IMF	International Monetary Fund
PLSIRA	Plateau State Infrastructure and Regulatory Agency
PLSG	Plateau State Government
LTFP	Long-Term Fiscal Planning
NGN	Nigerian Naira
OBC	Outline Business Case
PCN	Project Concept Note
PFRM	Project Fiscal Risk Matrix
PFRR	Project Fiscal Risk Register
PPP	Public-Private Partnership
P#	Project Number (e.g., P1, P2)
PPP-AC	Public-Private Partnership Accommodation (Theoretical Example in FCCL Tool)
USD	United States Dollar

Introduction

1.1 Purpose of the Manual

The Plateau State Long-Term Fiscal Planning Tool (LTFP Tool or Tool) is an Excel-based tool developed to assist in the identification, assessment, and monitoring of Fiscal Commitments and Contingent Liabilities (FCCL) arising from public-private partnership (PPP) projects. This document serves as a draft manual (the LTFP Manual or Manual) to effectively guide users of the LTFP Tool.

The FCCL guidelines and methodology for FCCL management (the FCCL Framework), proposed by the Plateau State Government, enable the identification, assessment, and monitoring of FCCL. Users of the LTFP Tool and this Manual must be well-versed with the guidelines established in the FCCL Framework and adopt them for effective FCCL management.

The FCCL Framework provides a comprehensive description of fiscal liabilities associated with PPP contracts, as outlined in the FCCL Guidelines. It also includes a detailed methodology for identifying and assessing budgetary risks and contingent liabilities (CL) in line with the Technical Guidance. A thorough understanding of these principles is essential for utilizing the LTFP Tool.

The Tool includes practical templates for evaluating project risks and calculating direct fiscal commitments (FC) and contingent liabilities (CL) in PPP schemes. It is designed to align with the FCCL Framework to ensure accuracy and reliability.

The Tool is primarily intended for the Debt Management Department (DMD) within the Plateau State Ministry of Finance (PLSMOF). The DMD is responsible for overseeing and reporting on FCCLs, particularly those arising from PPPs. However, the Tool's effectiveness depends on the quality of project assumptions provided by the Contracting Authority (CA) or the Plateau State Infrastructure and Regulatory Agency (PLSIRA).

1.2 LTFP Tool Layout

The Long-Term Fiscal Planning Tool (LTFP Tool) is structured to process inputs from specific PPP projects. It enables the calculation of Fiscal Commitments and Contingent Liabilities (FCCLs) at the project level and provides an aggregated overview of the state's total commitments and liabilities.

The Tool integrates assumptions based on Plateau State's projected macroeconomic indicators, including Gross Domestic Product (GDP), debt, revenues, and expenditures. These assumptions serve as a baseline for evaluating the Fiscal Commitments (FC) and Contingent Liabilities (CL) associated with individual projects and assessing their cumulative impact at the state level. This structure ensures a comprehensive fiscal planning and risk management approach for PPP projects.

The LTFP Tool is structured to incorporate inputs from specific projects, calculate the FCCLs per project, and provide an aggregate picture of state-level commitments and liabilities.

The LTFP Tool also integrates assumptions for Plateau State's projected macroeconomic parameters, such as GDP, debt, revenues, and expenditures, against which the FC and CL are assessed at the project and state levels.

Figure 0-1 Presents the FCCL assessment structure within the Tool.

Figure 0-1: FCCL assessment structure

FCCL Assessment Structure with Links

This table links the Inputs and Calculations to the Outputs, ensuring clarity in the relationship between data entry, processing, and resulting fiscal commitments and liabilities.

Category	Details	Linked Outputs
Inputs (Macroeconomic Assumptions)	Plateau State GDP, Debt, Revenues and Expenditures, Inflation Rates, Monetary Policy Rate, Foreign Exchange Rate, Probability of Default, Monte Carlo Simulations.	Used in calculating both Fiscal Commitments and Contingent Liabilities.
Project Specifics	Project Schedule, CAPEX and OPEX, Financing Structure, Payment Mechanisms, Revenue Projections, Foreign Exchange Risks, Termination Compensation.	Feeds into project-specific calculations for Fiscal Commitments and Contingent Liabilities.
Calculation (Fiscal Commitments)	Construction Grants, Viability Gap Funding, Operating Subsidies, Availability Payments, NPV Calculation using Discount Rates.	Outputs are annual net fiscal commitments and NPV of net budgetary obligations.
Calculation (Contingent Liabilities)	Revenue Guarantees, Market or Volume Guarantees, Foreign Exchange Guarantees, Termination Payments, Scenario Analysis and Risk Modeling.	Outputs as Annual Net Contingent Liabilities and NPV of Net Contingent Liabilities.
Outputs	Annual Net Fiscal Commitments, NPV of Net Fiscal Commitments, Annual Net Contingent Liabilities, NPV of Net Contingent Liabilities, Aggregated Overview of Commitments.	Provides a comprehensive overview for fiscal planning and decision-making.

Subsequent sections present each of the Tool's components. The Tool is an Excel-based workbook organized according to the following Excel worksheets.

Table 0-1: Summary of the worksheets included in the model

Sheet Name	Component	Description
Cover Sheet	Disclaimer	Contains important disclaimers regarding the use of the Tool.
Notes to Users	Guidance on how to use the Tool	This section provides step-by-step instructions for populating project data, calculating FCCL based on Monte Carlo simulations, and updating consolidated dashboards.
Dashboard Totals	Consolidated Assessments	It provides tables and graphs of FCCL on an NPV basis and compares them with Plateau State's macroeconomic data in the assessment year.
Dashboard Annual	Consolidated Assessments	It provides tables and graphical summaries of FCCL and compares them with Plateau State's macroeconomic data annually.
PLSG MacroEco	Macro-Economic Inputs	This provides Plateau State's macroeconomic assumptions, including GDP, debt, revenues, expenditures, inflation, and the NGN exchange rate.
Monte Carlo Simulations	Monte Carlo Simulations Inputs and Outputs	A sheet for calculating revenue, volume, and foreign exchange rate profiles using a Monte Carlo simulation approach.
P1-Risk	Project 1 Overview and Fiscal Risks Identification	Includes Project 1's name, sector, and type, as well as its Risk Matrix and Register by FCCL guidelines.
P1-FCCL	Project 1 FCCL Assessments	This includes Project 1's FCCL calculation based on assumptions entered into the same sheet.
P2-Risk	Project 2 Overview and Fiscal Risks Identification	Includes Project 2's name, sector, and type, as well as its Risk Matrix and Register by FCCL guidelines.
P2-FCCL	Project 2 FCCL Assessments	This includes Project 2's FCCL calculation based on assumptions entered the same sheet.
P#-Risk	Project # Overview and Fiscal Risks Identification	It includes the project #'s name, sector, and type, as well as its risk matrix and registers under FCCL guidelines.
P-FCCL	Project # FCCL Assessments	This includes the Project's FCCL calculation based on assumptions entered into the same sheet.

1.3 LFTP Data base

The Tool incorporates information on four projects currently in the Plateau State Government (PLSG) Public-Private Partnership (PPP) project pipeline (refer to Section 1.1.1 of the FCCL Framework), along with one example of a theoretical accommodation PPP. However, these projects are still in the early stages of preparation, and their FCCL impact has not yet been identified or quantified by PLSIRA. To facilitate the FCCL assessment, sample financial data, rather than actual project information, have been

used in the worksheet based on the project type. This placeholder data will need to be updated by PLSG once the Outline Business Case (OBC) for the projects is completed. The theoretical PPP accommodation project has been included as Project 5 (P5) solely for demonstration purposes.

1.4 Overall Guideline for the Use of Tools

1.4.1 Cell Coding

The following is the cell coding across the various sheets.

- **Input cells**:

  All input cells allow numeric inputs and are in orange colour. The users should input data in these cells as per guidance of the indicated units (date, amounts or %) in the adjacent cell.

> Don't input values in units other than indicated in the adjacent cell as this would result in errors.

- All **Yes or No** cell are equipped with a scroll-down function: 

- **Computed cells**:

  All pre-programmed computed cells are in grey. The user should not modify these.

> Don't input values in pre-programmed cells, as this would result in errors.

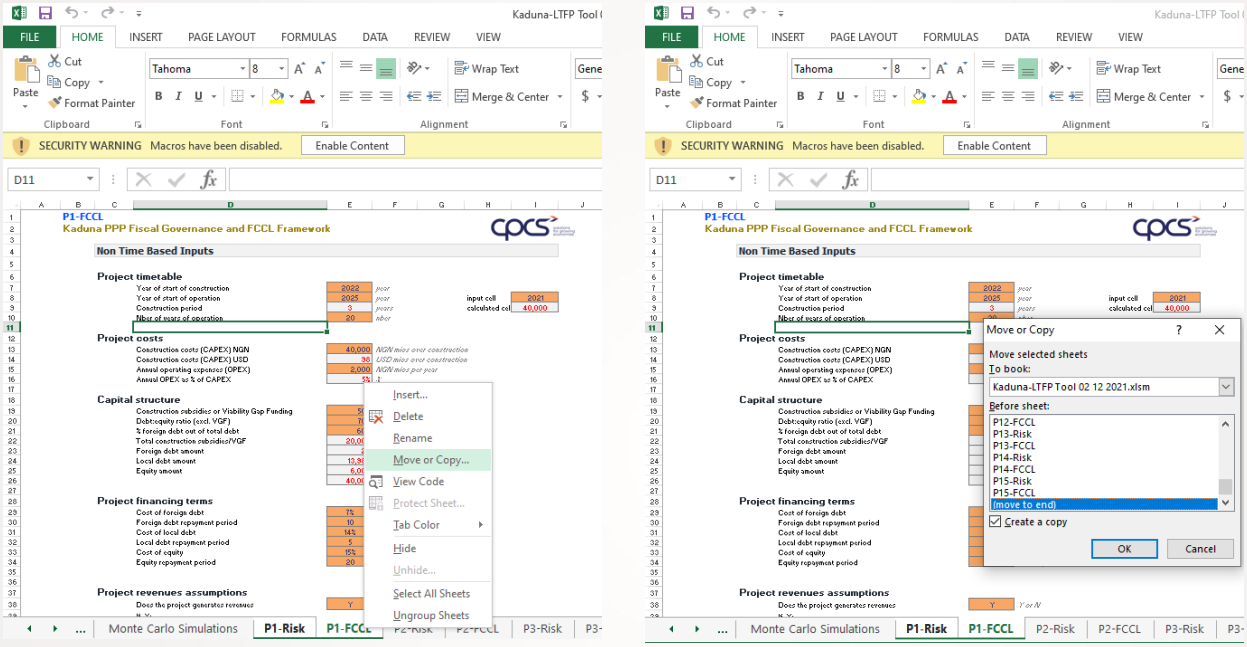
Adding projects

The step-wise process to add project-based information is summarised below.

Step 1	Step 2	Step 3	Step 4
Select the two project sheets of 'P#-Risk' and 'P#- FCCL' simultaneously	Right-click on the sheet tab, select 'Move or Copy', then click 'Create a Copy".	Rename the two new worksheets. For example, 'P16-Risk' and 'P16-FCCL'	Input the Project Overview in the "P10-Risk' Sheet with the following: • Project name • Sector • Implementation status • Type of project • Year of assessment

Creating new project sheets: When analyzing a new project, the user shall simultaneously select the two project sheets of 'P#-Risk' and 'P#- FCCL' and create a copy (as reflected in screenshots below). The worksheet tabs should then be renamed; for example, for project number ten, the worksheet tabs would be renamed as 'P10-Risk' and 'P10-FCCL.'

Figure 0-2: Creating new project sheets



Do select the 'P#-Risk' and 'P#- FCCL' simultaneously and create a copy to ensure no programming errors.

- **Project overview in 'P#-Risk' sheet**: The user should then input the project assumptions starting with the Project Overview, including the project name, sector, status, and type, as well as the year of assessment.

  The Project Overview captures the following information:

Table 0-2: Project Overview options

Project Overview	Options
Sectors	• Transport • Energy • Water & Sanitation • Agriculture • Education • Health • Housing

Project Overview	Options
Implementation status	• **Pipeline:** Projects that PLSIRA has approved as part of the PPP project pipeline but OBC has not commenced • **OBC:** projects for which OBC analysis is being undertaken • **Procurement:** Projects for which the procurement process has commenced based on an approved OBC • **FBC:** Project for which a private partner has been selected based on an approved Full Business Case (FBC) • **Execution:** Projects which have an executed PPP agreement and which are under implementation
Project Type	The Tool has been structured to facilitate the identification and assessment of FCCL by distinguishing two primary types of PPP based on the revenue source of the private partner: • **Government Availability Payments (GAP):** This is a PPP type in which the Government makes fee payments to the private partner once the project is completed and ready to use. In this case, the CA may offset the direct FC associated with the availability payments with revenue from the project's users. • **User's Payments (UP) with the provision of Viability Gap Funding (VGF) and Revenue Guarantee:** Under this model, the private partner is reimbursed directly by collecting payment from the project users (as opposed to the Government's payments). In this case, FC could arise from VGF during construction and operating subsidies during the operational phase. CLs if the PPP agreement provides a revenue or volume guarantee. After entering a new project name, sector, and status, the user shall qualify the project type by answering "Y" (yes) or "N" (no) to determine whether the private partner receives availability payments from the Government. This response automatically triggers the corresponding calculation of revenue the private partner earns.

Figure 0-3 This shows an example of a Project Overview for one of the Plateau State Water Supply Project, which was used to demonstrate the tool's operation.

Figure 0-3: Project Overview example from P1-Risk sheet of LTFP Tool

Field	Example Value	Description
Project Name	Plateau State Renewable Energy Project	The title of the project being assessed.
Sector	Water	The sector to which the project belongs.
Implementation Status	Preliminary Feasibility Study Completed	The current stage of the project.

Type of Project	Public-Private Partnership (PPP)	The financial or operational model used.
Year of Assessment	2024	The year in which the project's FCCL is being assessed.

Project Analysis

- **Project Fiscal Risk Matrix and Register:** As Section 2 of the FCCL Framework outlines, users can begin by providing inputs into the Project Fiscal Risk Matrix (PFRM) and Register. This step is crucial for identifying and analyzing project-specific fiscal risks.
- **FCCL Register:** As detailed in Section 3, users can populate project assumptions in the "P#-FCCL" sheet to calculate the FCCL for each project. This step involves entering project-specific data to quantify fiscal commitments and contingent liabilities.

1.5 Limitation of Tools

Using the LTFP Tool and this Manual requires prior knowledge and understanding of the FCCL Framework. The LTFP Tool simulates FCCL outcomes for PLSG based on user-provided inputs, and its accuracy depends on the reliability of those inputs. The Tool is designed to assist PLSG in understanding FCCL implications and implementing informed mitigation measures to manage fiscal risks effectively.

2. Project Risk Assessment

Fiscal Risk Assessment Methodology

The Technical Guidance of the FCCL Framework provides a structured approach for assessing budgetary risks associated with PPP projects. This approach includes two primary tasks:

1. **Development of the Project Fiscal Risk Matrix (PFRM):**
    - The PFRM facilitates qualitative **assessment** and prioritization of fiscal risks using a project heat map structure.
    - It helps risk managers identify major risks throughout the project life cycle, assess their likelihood of occurrence, and evaluate their fiscal impact.
    - The methodology is based on the **Project Fiscal Risk Assessment Model (PFRAM)** developed by the World Bank and incorporates mitigation measures (refer to Appendix A of the FCCL Framework).
2. **Development of the Project Fiscal Risk Register (PFRR):**
    - The PFRR quantifies the contingent liabilities (CL) arising from fiscal risks identified in the PFRM.
    - It outlines priority risk mitigation actions derived from the project heat map.
    - This register aligns with the PFRM and provides a quantitative basis for fiscal risk management.

The LTFP Tool includes pre-designed templates for the PFRM and PFRR, available in the Project Risk Sheet for each PPP project.

2.2 Project Risk Sheet

2.2.1 Project Overview

As noted in Section 1.4.2, the Project Risk Sheet (labeled as "P#-Risk" sheet) begins with basic project information such as:

- Project Name
- Sector
- Status
- Type

These fields must be completed first when a new project is added. (Refer to **Figure 1.2: Project Overview Example** from the P1-Risk sheet of the LTFP Tool).

2.2.2 PFRM or Project Heat Map

The Project Risk Sheet in the LTFP Tool includes a pre-formatted PFRM. This matrix is generated automatically based on user inputs, enabling a structured visualization and prioritization of fiscal risks.

(Refer to **Figure 2.1: PFRM Example** from the LTFP Tool).

Project Fiscal Risk Matrix

RISK IDENTIFICATION	LIKELIHOOD	FISCAL IMPACT	RISK RATING likelihood*impact	MITIGATION STRATEGY Is it in place ?	PRIORITY ACTIONS
GOVERNANCE	LOW	LOW	IRRELEVANT	YES	NO ACTION
CONSTRUCTION	HIGH	MEDIUM	HIGH	YES	MEDIUM PRIORITY
OPERATION	MEDIUM	MEDIUM	MEDIUM	NO	HIGH PRIORITY
DEMAND	MEDIUM	HIGH	HIGH	NO	HIGH PRIORITY
FINANCIAL	MEDIUM	HIGH	HIGH	NO	HIGH PRIORITY
FORCE MAJEURE	LOW	HIGH	MEDIUM	YES	MEDIUM PRIORITY
MATERIAL ADVERSE GOVERNEMENT ACTIONS	LOW	HIGH	MEDIUM	NO	HIGH PRIORITY
CHANGE IN LAW	MEDIUM	LOW	LOW	YES	LOW PRIORITY
REBALANCING OF FINANCIAL EQUIBRIUM	MEDIUM	MEDIUM	MEDIUM	NO	HIGH PRIORITY
RENEGOTIATION	LOW	MEDIUM	LOW	NO	MEDIUM PRIORITY
CONTRACT TERMINATION	MEDIUM	MEDIUM	MEDIUM	NO	HIGH PRIORITY

Risk Rating = Likelihood x Fiscal Impact

Fiscal Impact	LOW	MEDIUM	HIGH
HIGH	Medium	High	Critical
MEDIUM	Low	Medium	High
LOW	Irrelevant	Low	Medium

Likelihood

Priority action = Risk rating x Mitigation measure

Mitigation measure	IRRELEVANT	LOW	MEDIUM	HIGH	CRITICAL
NO	No action	Medium priority	High priority	High priority	Critical
YES	No action	Low priority	Medium priority	Medium priority	High priority

Risk Rating

The categories of risks are identified according to the PFRAM risk identification (FCCL Framework—Appendix A).

A qualitative assessment of Likelihood and Fiscal Impact (Low, Medium, or High) and whether a mitigation strategy (Yes or No) must be entered, and the Risk Rating and Priority Actions will automatically be filled in.

2.2.3 PFRR

The user can populate the PFRR based on the priority actions determined on the project heat map of the PFRM, which allows for the further qualification and quantification of fiscal risks under the FCCL Framework (refer to section 3.2.1.2).

Figure 0-4: PFRR from LTFP Tool

Project Fiscal Risk Register

RISK IDENTIFICATION		RISK ALLOCATION	LIKELIHOOD	FISCAL IMPACT	RISK RATING		RISK MITIGATION	
Risk category	Event description	Government/Shared	Probability of occurrence	Base costs	Cost of risk materialisation - % of Base Costs	Composite of likelihood and impact	Measures	Cost
Governance								
Construction	Geological issues (R8)	Governement	15%	CAPEX	20%	3%		
Operation								
Demand	Shortfall in demand covered by revenue guarantee (R20)	Shared	40%	REVENUES	% depending on revenue guarantee	See calculation based on MC in the FCCL sheet		See calculation in the FCCL sheet
Financial	Exchange rate volatility (R31)	Governement		FOREIGN DEBT	% depending on foreign exhange rate guarantee	See calculation based on MC in the FCCL sheet		See calculation in the FCCL sheet
Force Majeure								
Material adverse government actions								
Change in law								
Rebalancing of financial equilibrium								
Renegotiation								
Contract termination	Compensation in case of early termination (R39-40)	Shared		DEBT+EQUITY	100%	See calculation example in the FCCL sheet		See calculation example in the FCCL sheet

The LTFP specifically provides for calculating potential CL linked to contract termination and, if relevant, revenue guarantee or foreign exchange rate guarantee in the "P#-FCCL" sheet, as detailed in the next section.

3. Project FCCL Assessment

3.1 FCCL Assessment Structure

The FCCL assessment is conducted in the "P#-FCCL" sheet, which is structured into three main sections:

1. **Non-Time-Based Inputs Section** (rows 4 to 100):
   This section captures project assumptions necessary for the FCCL calculation.
2. **Monte Carlo Simulation Inputs and Outputs** (rows 100 to 133):
   These inputs and outputs are used to calculate contingent liabilities (CL) related to revenue or volume guarantees and foreign exchange rate guarantees, where applicable.
3. **Time-Based Outputs Section** (rows 135 and onward):
   FCCL calculations are generated here based on project assumptions and macroeconomic inputs from the "PLSGMacroEco" sheet.

(All figures and numbers provided hereafter are illustrative.)

3.2 Project Assumptions / Non-Time-Based Inputs

Project assumptions are categorized into two main areas:

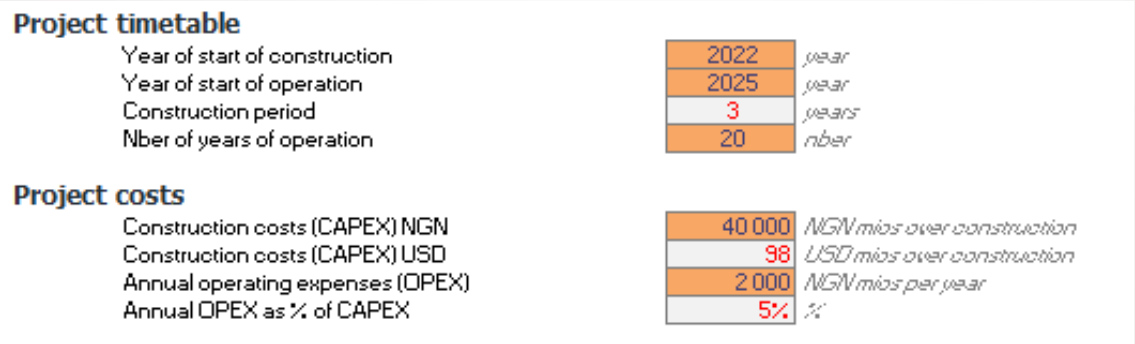
1. **Project Schedule and Financial Inputs:**
   Includes the construction duration, operation period, capital expenditures (CAPEX), operating expenses (OPEX), revenues, capital structure, and financing terms.
2. **FCCL-Specific Inputs:**
   Inputs vary depending on the project type, such as availability payment schemes or user-pay revenue models.

3.2.1 Project Schedule and Costs

The initial data required include:

- **Project Timetable:**
  - Start date of construction
  - Start date of operations
- **Project Costs:**
  - Capital Expenditure (CAPEX)
  - Annual Operating Expenditure (OPEX)

This foundational data provides the basis for the FCCL analysis in subsequent sections.



3.2.2 Project Capital Structure and Financing Terms

The next step is to input assumptions for the project's capital structure. The Tool captures potential sources of financing for project capital expenditures (CAPEX) and automatically computes their values as a percentage of the total project costs. These inputs include:

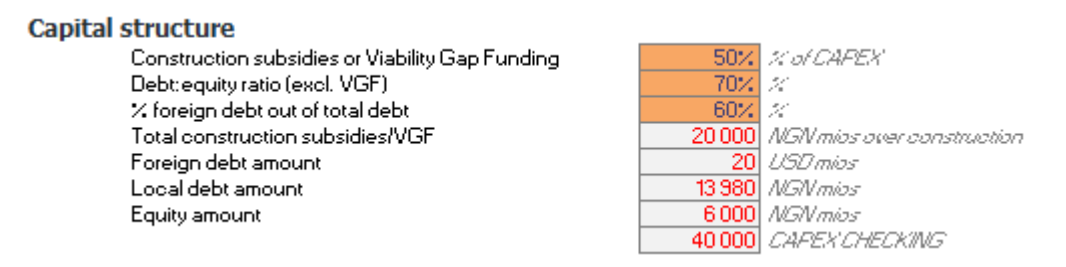
- **Subsidies During Construction Period:**
  - Subsidies, expressed as a percentage of CAPEX, are often required to fill the Viability Gap Funding (VGF) in user-pay revenue PPPs.
  - Such subsidies directly trigger fiscal commitments (FC).
- **Equity and Debt Portions:**
  - The equity and debt financing are determined based on the debt-to-equity ratio.
  - Debt financing covers the CAPEX minus the VGF, while equity financing covers the remaining portion.
- **Debt Composition:**
  - Within the debt portion, the Tool captures the percentage denominated in USD.
  - USD-denominated debt may trigger contingent liabilities (CL) if a foreign exchange rate guarantee is in place.

As illustrated in the figure below, the Tool computes values for:

- Government grants
- Equity in NGN
- Debt in both USD and NGN

Figure 3.2: Project Assumptions – Capital Structure

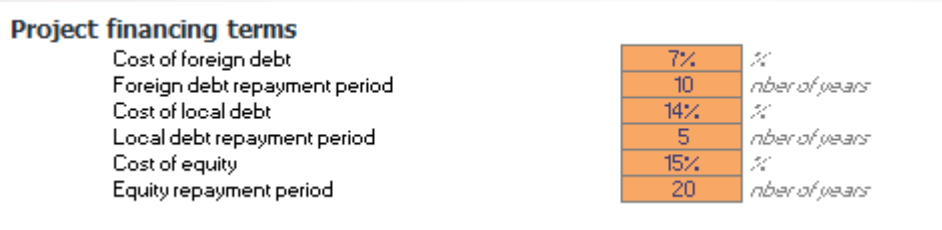
This structured breakdown accurately represents the project's financing terms and associated fiscal and contingent liabilities.



Capital structure		
Construction subsidies or Viability Gap Funding	50%	% of CAPEX
Debt:equity ratio (excl. VGF)	70%	%
% foreign debt out of total debt	60%	%
Total construction subsidies/VGF	20 000	NGN mios over construction
Foreign debt amount	20	USD mios
Local debt amount	13 980	NGN mios
Equity amount	6 000	NGN mios
	40 000	CAPEX CHECKING

The terms of project financing for the equity and debt can be input in this section of a "P#-FCCL" sheet, specifically average cost (%) and term (number of years) as shown in the following snapshot

Figure 0-5: Project Assumptions – Financing terms

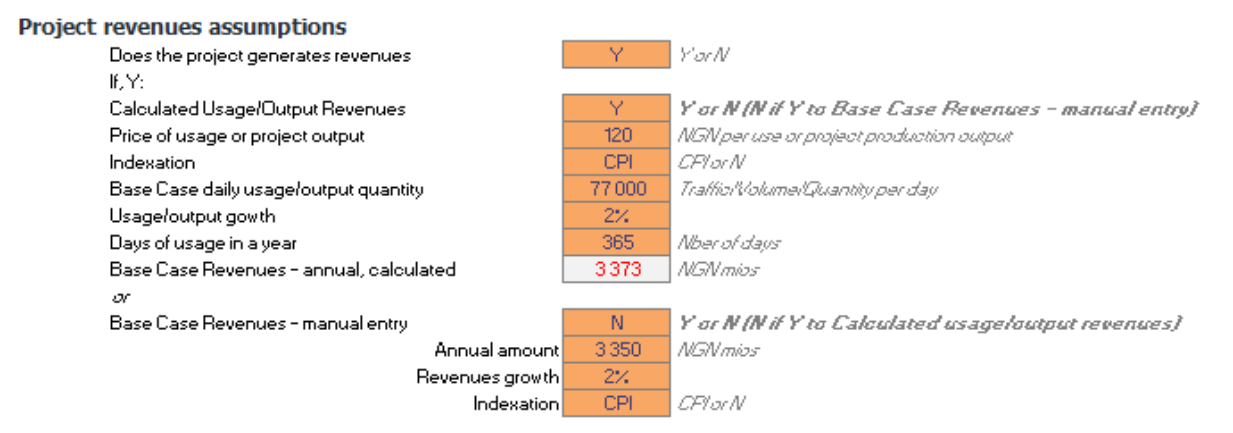


Project financing terms		
Cost of foreign debt	7%	%
Foreign debt repayment period	10	nber of years
Cost of local debt	14%	%
Local debt repayment period	5	nber of years
Cost of equity	15%	%
Equity repayment period	20	nber of years

The cost of debt corresponds to the interest rate applied by the lenders whereas the cost of equity is determined by the investors expected return. The equity repayment period is usually the length of operation. These terms are typically extracted from the project financial model developed at the OBC or FBC stage. From these terms, the schedules of each of these financing instruments are auto-calculated in the FCCL sheet. These schedules are used to calculate availability payments (if relevant) and termination compensation as explained further in section 0.

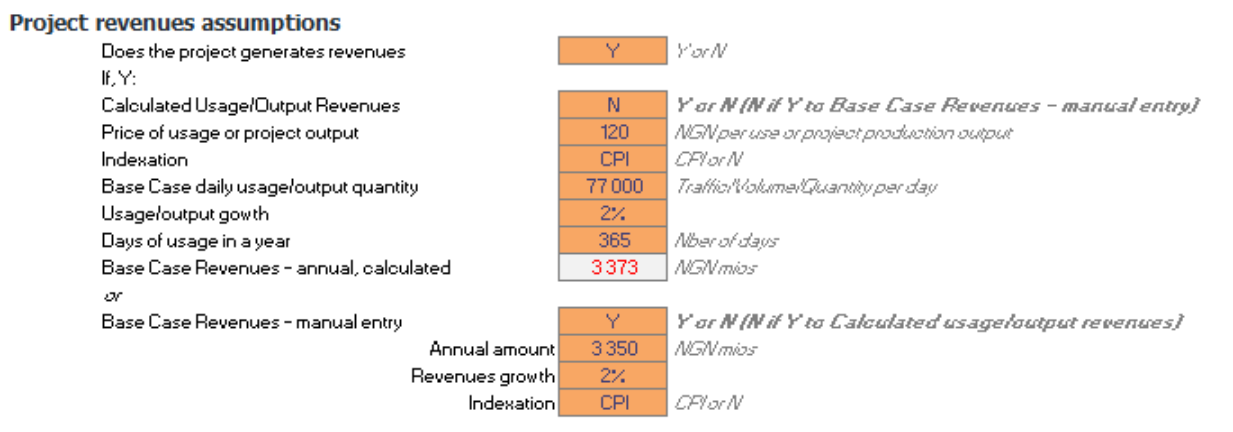
3.2.3 Project revenues

The next step is to capture assumptions for the project revenues. This part should be filled in in case of a user pay structure.



- If the project generates revenues from users, the Tool allows for either a calculated revenue based on a price/tariff of usage or project output and a daily volume of usage or production or a manual entry of an annual base case revenue. In both cases, indexation and/or growth rate can be applied.

Figure 0-6: Project Assumptions – Revenues



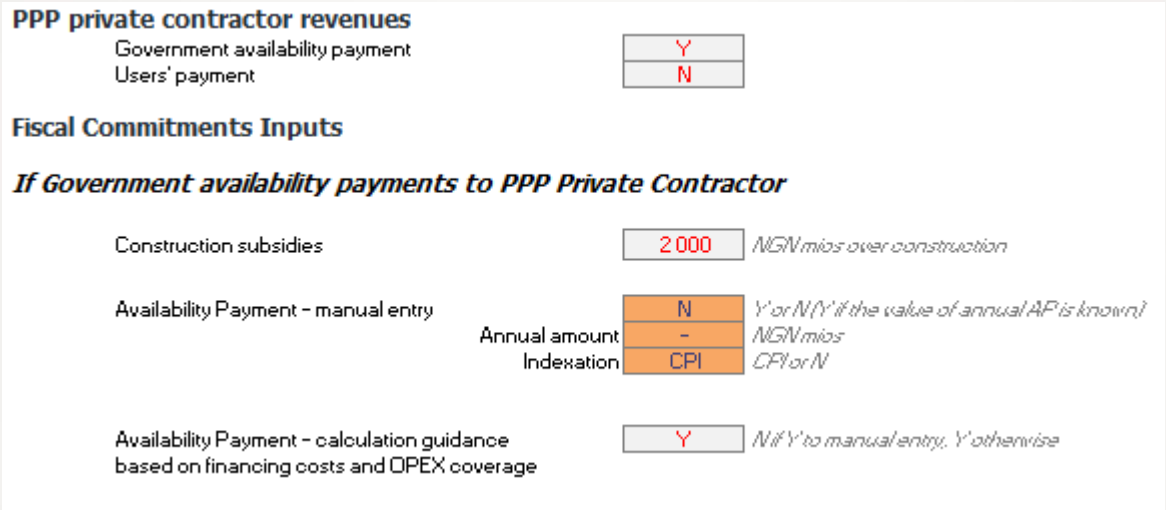
3.2.4 Fiscal Commitment Inputs

Once the assumptions on project costs, financing and revenues have been entered, the users can make further choices for FCCL calculation depending on whether the private partner receives availability-based Government payment or is remunerated by the project users.

In case the private partner receives availability payments, these will trigger FC, which can be either calculated by the Tool (based on the coverage of OPEX and financing costs) or entered manually if, for instance, their value is known through the OBC/FBC or PPP agreement. FC could also include construction subsidies if any.

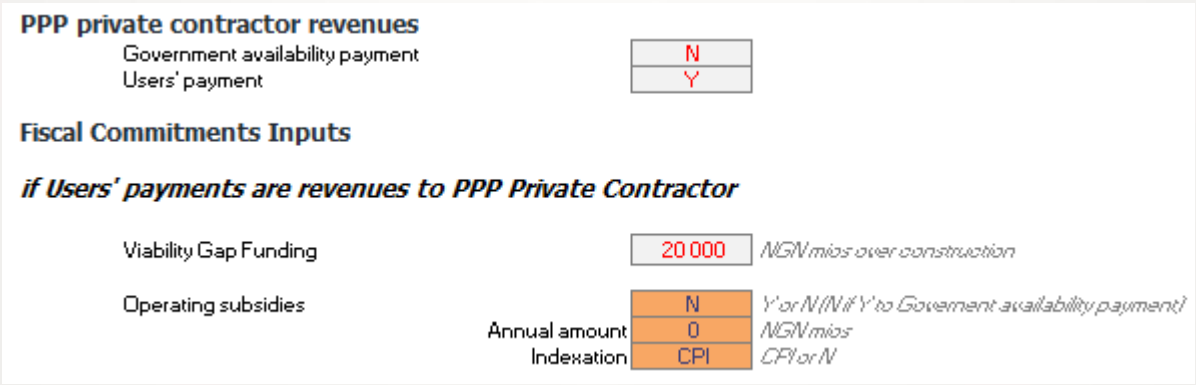
The snapshot below shows the FC inputs part of the non-time-based assumptions in the "P#-FCCL" sheet, where the choice of calculated or manually entered availability payment is made.

Figure 0-7: Fiscal Commitments Inputs – Availability payments



If the private partner is remunerated by the project revenues, FC could include VGF during construction and operating subsidies. The latter are entered in this part of the "P#-FCCL" sheet.

Figure 0-8: Fiscal Commitments Inputs – Operating subsidies

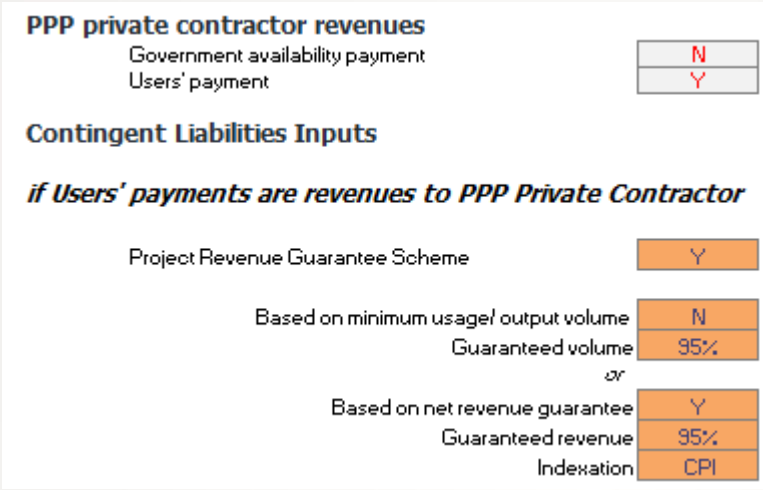


3.2.5 Contingent Liabilities Inputs

Where users remunerate the private partner, there could be CL arising from revenue or volume guarantee. If applicable, the user should enter whether the guarantee is based on

- an annual minimum guaranteed revenue (as a % of the base case revenue) or
- A daily minimum volume of usage or output (as a % of the base case daily volume) as shown in the snapshot below.

Figure 0-9: Contingent Liabilities Inputs – Revenue guarantee scheme



In both types of PPP schemes, the LTFP provides for the calculation of an exchange rate guarantee. In this section of the "P#-FCCL" sheet, the user must enter the portion of the foreign debt for which a foreign exchange rate guarantee has been provided.

Figure 0-10: Contingent Liabilities Inputs – Foreign exchange rate guarantee

Finally, systematic and potentially significant CLs arising from PPP arise from the possibility of terminating a contract before its contractual expiry. In the event of either party's default on a PPP transaction resulting in its early termination, compensation will usually be due to the private partner/operator, particularly if termination is caused by a public sector event of default /breach.

Typically, the termination payments are based on the private partner/operator's debt liabilities at the time of termination. LTFP allows two types of inputs with potential termination

The time of termination. LTFP allows two types of inputs concerning potential termination.

1) % of debt and equity repaid through compensation in case of early termination (typically 100% in case of termination for public sector default)

2) the probability of default, which is entered into the macro-economic sheet of the Tool ("PLSGMacroEco" sheet)

Figure 0-11: Contingent Liabilities Inputs – Termination payments

The quantitative assessment of CLs associated with guarantee schemes or early termination event is presented in Section 3.4.2.

3.3 Monte Carlo Simulations

The Tool provides for the calculation of CL in case of revenue or volume guarantee and foreign exchange rate guarantee based on Monte Carlo simulation. MC simulation can also be used for

the calculation of revenues forecasts offsetting availability payments. These simulations are contained in the "Monte Carlo Simulations" sheet.

Monte Carlo is a modelling technique consisting in generating random variables on the basis of probability distributions. In the Tool, the random variables generated by the simulations are annual growths (in %) which are applied to initial annual revenue, volume and/or foreign exchange rate to generate forecasted profiles which are then compared with base case profiles to produce adjustment factors.

The Tool includes the flexibility to use three types of probability distributions for each profile: triangular, normal distribution or geometric Brownian motion process.

The choice of distribution types for FCCL assessment is made in the "Monte Carlo Simulations" sheet of the Tool while their parameters for a given project are entered into the "P# FCCL" sheet (rows 102 to 124)

Once the project specific assumptions have been filled in the "P# FCCL" sheet, the CL can be assessed by running Monte Carlo simulations in the "Monte Carlo Simulations" sheet as shown in the snapshot below.

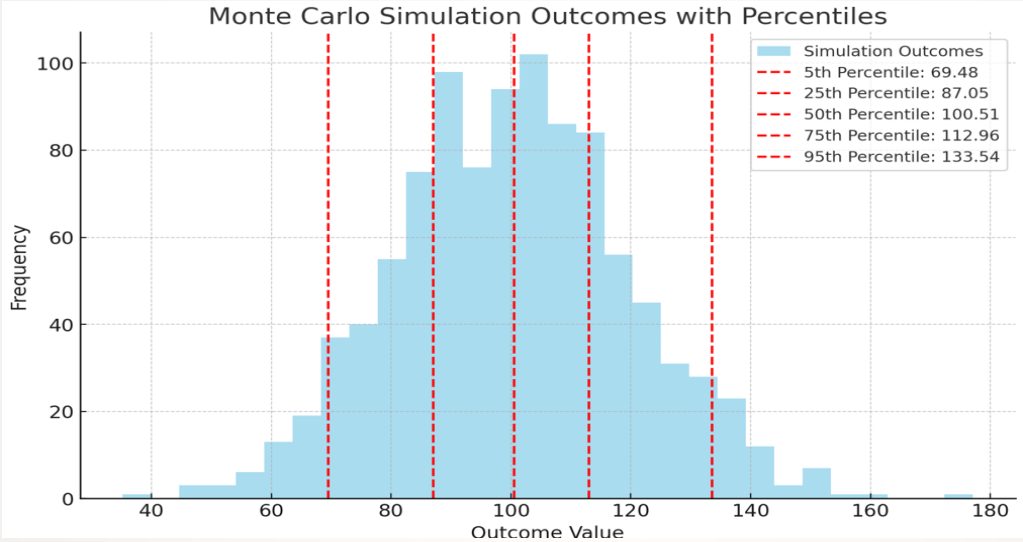
Figure 0-12: Monte Carlo Simulations – Running instructions

The simulations calculate revenues, volumes or FX rates based on a simulation of annual growth rates (i.e. growth rates are simulated based on a given probability distribution defined by the user). The resulting profile for revenues/volumes/FX rates are then converted into a variation (in % terms) from the base case projections. The Monte Carlo analysis simulates 1,000 simulated profiles based on the probability distribution selected by the user. The simulated profile representing the average cumulative variance is then pasted back into the relevant "P#-FCCL" sheet for the calculation of relevant CL.

To assist the user in understanding what the simulation is doing, the "Monte Carlo Simulations" sheet provides for the graphical presentations of percentiles resulting from the simulation for each

simulated variation profiles. An example of such percentile curves based on a triangular distribution is shown in the snapshot below.

Figure 0-13: Monte Carlo Simulations – Example of percentiles outcome



Appendix B provides for further explanation on the MC simulation modeling and presentation of available probability distributions including guidance on how to determine their parameters

3.4 FCCL Calculations / Time-Based-Outputs

3.4.1 Fiscal commitments

As explained in Section 3.2.4 above, FC calculations depend on the type of PPP project.

For a PPP where the private partner receives **availability payments** from the Government, FC will include these payments, to which could be added some **construction subsidies**, if any.

The Tool provides for the calculation of availability payments based on the coverage of OPEX and financing costs. These financing costs are calculated in the financing instruments schedule provided in the "P#-FCCL" sheet (from row 235 onwards) based on the annuity which should be paid to each instrument provider in accordance with its cost and maturity as entered in the Project assumptions (refer to section **Error! Reference source not found.**). It also establishes the annual balance, i.e. the outstanding amount due at the end of each year for each instrument (see figure below). In case of an availability-based PPP, the sum of the annuities forms the part of the availability payments which covers the financing costs. The financing balances constitutes the financial liabilities to be covered by the termination compensation.

Figure 0-14: Financing instruments schedule

Financing instruments schedule
Calculation of equity and debt liabilities on the basis of which are calculated termination payments and, where applicable, availability payments.

Equity repayment index			0	0	0	0	1	1	1	1	1	1	1
Equity schedule	NGN mios		0	0	1,600	3,200	4,800	4,753	4,699	4,637	4,566	4,484	4,390
Drawdown		4,800	0	1,600	1,600	1,600	0	0	0	0	0	0	0
Repayment	NGN mios		0	0	0	0	-47	-54	-62	-71	-82	-94	-108
Balance	NGN mios		0	1,600	3,200	4,800	4,753	4,699	4,637	4,566	4,484	4,390	4,281
Interest	NGN mios		0	0	0	0	720	713	705	696	685	673	658
Annuity	NGN mios		0	0	0	0	767	767	767	767	767	767	767
Local debt repayment index			0	0	0	0	1	1	1	1	1	0	0
Foreign debt schedule			0	0	3,728	7,456	11,184	9,492	7,563	5,364	2,858	0	0
Drawdown	NGN mios	11,184	0	3,728	3,728	3,728	0	0	0	0	0	0	0
Repayment	NGN mios		0	0	0	0	-1,692	-1,929	-2,199	-2,507	-2,858	0	0
Balance	NGN mios		0	3,728	7,456	11,184	9,492	7,563	5,364	2,858	0	0	0
Interest	NGN mios		0	0	0	0	1,566	1,329	1,059	751	400	0	0
Annuity	NGN mios		0	0	0	0	3,258	3,258	3,258	3,258	3,258	0	0
Foreign debt repayment index			0	0	0	0	1	1	1	1	1	1	1
Foreign debt schedule (USD mios)	USD mios		0	0	5	11	16	15	14	13	11	10	8
Drawdown	USD mios	16	0	5	5	5	0	0	0	0	0	0	0
Repayment	USD mios		0	0	0	0	-1	-1	-1	-1	-2	-2	-2
Balance (USD mios)	USD mios		0	5	11	16	15	14	13	11	10	8	6
Balance (NGN mios)	NGN mios		0	2,330	4,846	7,559	7,292	6,951	6,524	6,001	5,369	4,613	3,717
Interest	USD mios		0	0	0	0	1	1	1	1	1	1	1
Annuity (USD mios)	USD mios		0	0	0	0	2	2	2	2	2	2	2
Annuity (NGN mios)	NGN mios		0	0	0	0	1,119	1,164	1,211	1,259	1,309	1,362	1,416

The user can also choose to enter the availability payment manually.

In case the project generates revenues, it is assumed that they are collected by the Government to help offset the availability payments. The project revenues profile offsetting the availability payments is adjusted using Monte Carlo simulation in order to better assess the actual fiscal impact.

In the "P#-FCCL" sheet, the Tool shows the annual FCs as the sum of construction subsidies and availability payments (either calculated or entered manually) and calculates its NPV. An example of such computation is shown in the figure hereafter.

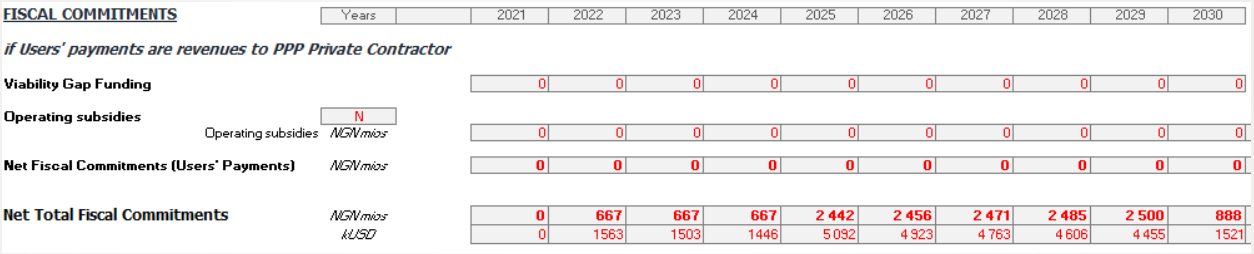
Figure 0-15: Fiscal Commitments Example – Availability Payments PPP

Figure 0-16: Fiscal Commitments Example – Availability Payments PPP

FISCAL COMMITMENTS	Years		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
If Government availability payment to PPP Private Contractor												
Construction subsidies			0	667	667	667	0	0	0	0	0	0
Availabilty Payments – manual entry	N		0	0	0	0	0	0	0	0	0	0
Availabilty Payments – guidance calculation	Y											
Availabilty Payments covering financing	NGN mios		0	0	0	0	2 479	2 498	2 517	2 537	2 558	951
Availabilty Payments covering OPEX	NGN mios		0	0	0	0	655	701	750	803	859	919
Total Availability Payments	NGN mios		0	0	0	0	3 134	3 199	3 267	3 340	3 417	1870
Revenues – Availability Payments Offsets	Y											
Base Case Revenue – manual entry	NGN mios		0	0	0	0	0	0	0	0	0	0
Base Case Revenue – calculated	NGN mios		0	0	0	0	37	40	44	48	52	57
Base Case Usage or Volume output – calculated	per day		0	0	0	0	510	520	531	541	552	563
Price of usage/Tariff	NGN		0	0	0	0	197	210	225	241	258	276
Availabilty Payment Offsets based on Project Revenue	NGN mios		0	0	0	0	37	42	46	52	58	63
Net Fiscal Commitments (GAP scheme)	NGN mios		**0**	**667**	**667**	**667**	**2 442**	**2 456**	**2 471**	**2 485**	**2 500**	**888**
NPV of Net Fiscal Commitments (GAP scheme)		8 859										

For a PPP project where private partner is remunerated from project users, FC include potential **VGF** and **operating subsidies** calculated in accordance with the project assumptions. An example is shown below.

Figure 0-17: Fiscal Commitments Example – Users paid PPP



FISCAL COMMITMENTS	Years	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
if Users' payments are revenues to PPP Private Contractor											
Viability Gap Funding		0	0	0	0	0	0	0	0	0	0
Operating subsidies	N										
Operating subsidies	MGN mios	0	0	0	0	0	0	0	0	0	0
Net Fiscal Commitments (Users' Payments)	MGN mios	0	0	0	0	0	0	0	0	0	0
Net Total Fiscal Commitments	MGN mios	0	667	667	667	2 442	2 456	2 471	2 485	2 500	888
	kUSD	0	1563	1503	1446	5 092	4 923	4 763	4 606	4 455	1521

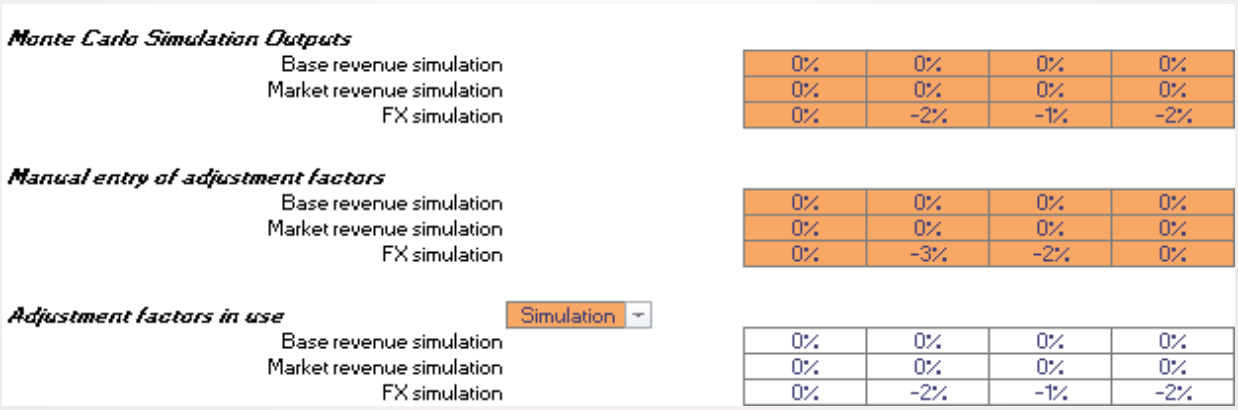
3.4.2 Contingent liabilities

The CL which are calculated based on the project assumptions include:

- Revenue guarantee (either based on a guaranteed amount or a guaranteed market/volume)
- Foreign exchange rate guarantee
- Termination payment

As explained in section 3.3, the CL linked to revenue guarantee or foreign exchange rate guarantee schemes can be calculated based on Monte Carlo Simulations. The running of the integrated macro into the "Monte Carlo Simulations" sheet will automatically generate adjustment factors for each of these guarantee schemes in accordance with project assumptions. However, the user can also manually enter the adjustment factors in the Tool as shown in the snapshot hereafter.

Figure 0-18: Contingent Liabilities – Adjustment factors for CL calculation linked to guarantee schemes



Monte Carlo Simulation Outputs					
Base revenue simulation	0%	0%	0%	0%
Market revenue simulation	0%	0%	0%	0%
FX simulation	0%	-2%	-1%	-2%
Manual entry of adjustment factors					
Base revenue simulation	0%	0%	0%	0%
Market revenue simulation	0%	0%	0%	0%
FX simulation	0%	-3%	-2%	0%
Adjustment factors in use	Simulation				
Base revenue simulation	0%	0%	0%	0%
Market revenue simulation	0%	0%	0%	0%
FX simulation	0%	-2%	-1%	-2%

Revenue guarantee

The CL associated with a revenue guarantee scheme is calculated annually as the difference between the revenue guarantee (based on a monetary amount calculated as a percentage of the base case revenues as part of the CL inputs—cf. section 3.2.5) and the forecasted revenues profile in accordance with the adjustment factors either calculated by a Monte Carlo simulation or entered manually.

Market/Volume guarantee

The CL associated with a market or volume guarantee scheme is calculated annually based on the difference between the guaranteed market (based on a daily volume of usage/ project output quantity calculated as a % of the base daily usage/ output volumes as part of the CL inputs – cf. section 3.2.5) and the forecasted market profile under the adjustment factors either calculated by a Monte Carlo simulation or entered manually. This difference is multiplied by the usage price of usage to obtain a monetary amount.

Foreign exchange rate guarantee

The CL associated with a foreign exchange rate guarantee scheme is calculated annually as the foreign debt increases in annual cost consequent to the incremental depreciation of the NGN against the USD compared with the base forecasted profile, which assumes purchasing power parity between NGN and USD.

The tool's macroeconomic sheet ("PLSG Macro Eco" sheet) assumes Nigerian and US inflation, and the NGN: USD exchange rate profile is forecasted by purchasing power parity.

Figure 0-19: Macro-economic assumptions – inflation and foreign exchange rate

Macro-Economic Assumptions for Nigeria

Below are illustrative assumptions for Nigeria's inflation, foreign exchange rate, and purchasing power parity (PPP). These assumptions can be tailored to reflect current and projected economic data.

Indicator	Current Value	Projected Value (1 Year)	Projected Value (5 Years)	Source/Notes
Inflation Rate	18.5%	16.0%	12.0%	Based on Central Bank of Nigeria (CBN) and IMF projections.
Foreign Exchange Rate	₦1700/USD	₦1700/USD	₦950/USD	Reflects trends in managed float policies and market dynamics.
Purchasing Power Parity	₦275/USD (PPP-adjusted)	₦285/USD	₦310/USD	Reflects GDP deflator adjustments and cost of living.

The associated CL is assessed by the annual reporting of the increased debt service payment in NGN consequent to an incremental depreciation of the NGN against the USD. As per the guaranteed schemes, the adjustment factors for the forecasted FX profile can be either generated by Monte Carlo simulation or entered manually.

Termination payment

Termination payments are calculated annually based on the outstanding balances on the equity and debt instruments multiplied by the percentage of equity and debt covered on termination.

These payments are then weighted by the probability of default rate and the stream of weighted payments discounted at the Nigeria Monetary Policy rate to assess the associated CL. Under this probability adjusted approach for determining termination payments, the minimum discounted value of the weighted annual fees and the overall financing outstanding balance is used as the CL amount for each year.

Other contingent liabilities

Finally, the Tool allows for the manual entry of other CLs. Those should be identified under the PFRR as detailed in the FCCL guidelines.

The figure below shows an example of typical CL calculation in "P#-FCCL" sheet. For illustration purpose, this example cumulates CL linked to revenues guarantees both based on guaranteed amount and market/volume although in practice there would one or the other or none.

Figure 0-1: Contingent Liabilities – illustrative example

CONTINGENT LIABILITIES	Years		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenue guarantee	Y											
Minimum Revenue Guarantee	Y											
Base Case revenue	*NGN mios*		0	0	0	0	4 479	4 888	5 335	5 823	6 355	6 936
Gurauranteed revenue	*NGN mios*		0	0	0	0	4 479	4 888	5 335	5 823	6 355	6 936
Revenue profile	*NGN mios*		0	0	0	0	4 399	4 744	5 240	5 651	6 241	6 731
Actual revenue guarantee	*NGN mios*		0	0	0	0	80	144	95	172	114	205
Market or Volume Guarantee	Y											
Base Case Usage or Volume output	*per day*		0	0	0	0	78 540	80 111	81 713	83 347	85 014	86 715
Minimum guaranteed usage or volume	*per day*		0	0	0	0	78 540	80 111	81 713	83 347	85 014	86 715
Usage or volume profile	*per day*		0	0	0	0	77 136	77 744	80 253	80 884	83 495	84 152
Price of usage/Tariff	*NGN*		0	0	0	0	157	168	180	193	206	221
Actual Market or Volume Guarantee	*NGN mios*		0	0	0	0	81	145	96	173	114	206
Foreign exchange rate guarantee												
Shortfall payment consequent to NGN depreciation scenario	*NGN mios*		0	0	0	0	48	26	45	80	70	116
Termination payments												
Compensation on termination	*NGN mios*		0	9 972	20 177	30 628	28 110	25 191	21 817	17 923	13 437	12 351
Weighted termination payments (Probability of default adjusted)	*NGN mios*		0	1 296	2 623	3 982	3 654	3 275	2 836	2 330	1 747	1 606
NPV of weighted termination payments (NGN mios)	*NGN mios*	14 626	0	9 972	14 626	14 626	14 626	14 626	14 626	14 626	13 437	12 351
Other contingent liabilities												
To be entered manually with reference to PFRR	*NGN mios*		0	0	0	0	0	0	0	0	0	0
Ex - Geological Risk triggers CL equal to 3% of CAPEX	*NGN mios*	2%	0	800	800	800	0	0	0	0	0	0

4 Portfolio Database and Impact Assessment

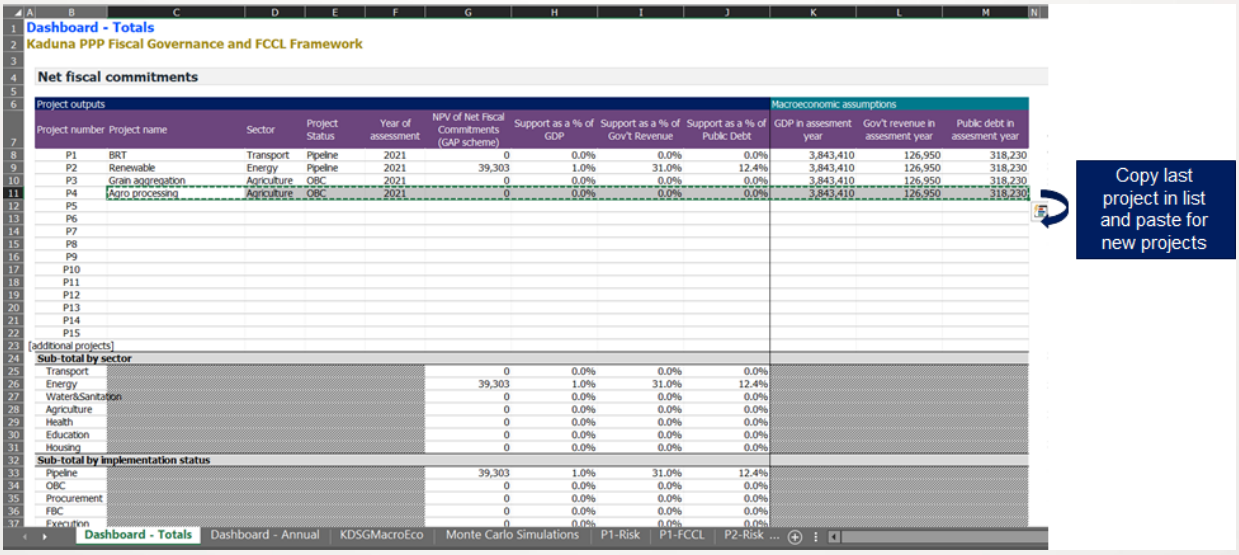
4.1 Projects Addition

The Tool initially includes [5] sets of P#-Risk and FCCL sheets with illustrative examples based on preliminary information received on 4 planned PPP projects plus one example of an accommodation PPP.

These illustrative examples are presented in Appendix A.

The Tool provides 10 blank P#-Risk and FCCL sheets. Once a new project is being assessed, these should be populated following the process described in Section 3. The formulae in the dashboard sheets (described below) should also be copied and pasted to ensure that all projects are captured in each calculation block in the dashboards. An example is shown in the figure below.

Figure 0-1: Extending the dashboard formulae when adding new projects



4.2 PLSG Macro-Economic Assumptions

The Tool includes a sheet titled **"PLSG MacroEco"** that outlines the PLSG's macroeconomic assumptions and forecasts.

Inputs to the "PLSG MacroEco" Sheet:

- **Inflation Rates:**
  Assumptions for both domestic and international inflation impacting fiscal and economic trends.
- **Foreign Exchange Rates:**
  Forecasted exchange rates between the NGN and other major currencies, especially USD.
- **Growth Rates:**
  - Projected growth rates for PLSG revenues and expenditures.

- Debt growth rates.
- GDP growth forecasts.

Data Integration:

The sheet incorporates inputs from PLSG budget forecasts provided by the PLSIRA for 2021–2025. Based on these inputs, the Tool calculates macroeconomic forecasts, which are used to support fiscal planning and project analysis.

Output Snapshot:

The **"PLSG MacroEco"** sheet generates forecasts for key economic variables, providing a detailed view of PLSG's financial trajectory over the forecast period.

Figure 4.2: PLSG Macro-Economic Forecasts in the "PLSG MacroEco" Sheet of the LTFP Tool

Year	ation Rate	change Ra	Growth Ra	evenue Gr	enditure G	Debt Grov	bt to GDP	Revenue	xpenditur	SG Debt (U	SG GDP (USD)
2024	18.5	770	2.5	8	7.5	5	35	1000	950	2000	5700
2025	16	820	3	8.5	8	5.5	34.5	1080	1020	2100	5900
2026	14.5	860	3.2	9	8.5	6	34	1165	1100	2220	6100
2027	13	900	3.5	9.2	9	6.5	33.5	1250	1200	2350	6300
2028	12	950	3.8	9.5	9.5	6.8	33	1350	1300	2500	6500
2029	11.5	1000	4	10	9.8	7	32.8	1450	1400	2650	6700
2030	11	1050	4.2	10.2	10	7.2	32.5	1550	1500	2800	6900
2031	10.5	1100	4.5	10.5	10.2	7.5	32.2	1650	1600	2950	7100
2032	10	1150	4.7	10.7	10.4	7.7	32	1760	1700	3100	7300
2033	9.5	1200	5	11	10.5	8	31.8	1880	1800	3250	7500

The sources for the above data is as follows:

- GDP/Inflation: SDP 2021 – 2025
- Expenditure: EIU Projections (Elasticity and Moving Averages)
- Total Revenue: SDP 2021 – 2025
- Debt: PLSG Clearing Arrears Framework

These should be updated periodically (to match the PLSG budgeting cycle) or as and when the estimates are updated in the source documents.

4.3 Portfolio Dashboards

The Tool provides for 2 Dashboard worksheets that aggregate the results of FCCL calculations on a portfolio basis.

These aggregations are made for:

1) Fiscal Commitments
2) Contingent Liabilities (excluding termination payments)
3) Contingent Liabilities about termination payments

Given that a termination event remains unlikely, termination payments CL are separated from guarantees CL to help CL budgeting.

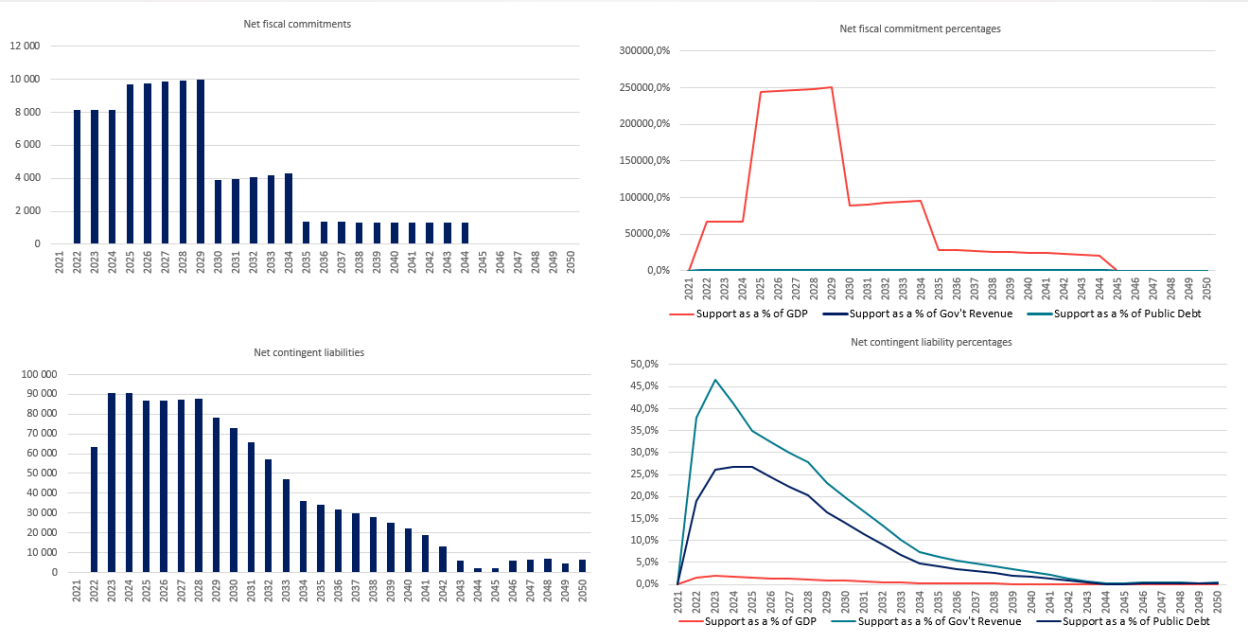
One sheet titled “Dashboard—Annual” aggregates the annual forecasts of FCCL of all projects and assesses their impact in percentage terms and on an annual basis on Government GDP, revenue, and public debt.

It also aggregates the results per sector and per project development status as shown below and provides for visual charts of results as shown in the snapshot below.

Figure 0-2: Annual Dashboard output examples

Net fiscal commitments

Net fiscal commitments											
Project number	Project name	Sector	Project Status	Net Total Fiscal Commitments							
				2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
P1	BRT	Transport	Pipeline	0	6 667	6 667	6 667	0	0	0	0	0	0
P2	Renewable	Energy	Pipeline	0	7 500	7 500	7 500	3 855	10 101	10 363	10 641	10 937	6 670
P3	Grain aggregation	Agriculture	OBC	0	0	0	0	0	0	0	0	0	0
P4	Agro processing	Agriculture	OBC	0	6 667	6 667	6 667	0	0	0	0	0	0
P5	Student Hostel	Housing	Procurement	0	667	667	667	3 098	3 159	3 224	3 293	3 366	1 813
P6	[blank project]												
P7	[blank project]												
P8	[blank project]												
P9	[blank project]												
P10	[blank project]												
P11	[blank project]												
P12	[blank project]												
P13	[blank project]												
P14	[blank project]												
P15	[blank project]												
additional projects]													
Sub-total by sector													
Transport				0	6 667	6 667	6 667	0	0	0	0	0	0
Energy				0	7 500	7 500	7 500	3 855	10 101	10 363	10 641	10 937	6 670
Water&Sanitation				0	0	0	0	0	0	0	0	0	0
Agriculture				0	6 667	6 667	6 667	0	0	0	0	0	0
Health				0	0	0	0	0	0	0	0	0	0
Education				0	0	0	0	0	0	0	0	0	0
Housing				0	667	667	667	3 098	3 159	3 224	3 293	3 366	1 813
Sub-total by implementation status													
Pipeline				0	14 167	14 167	14 167	3 855	10 101	10 363	10 641	10 937	6 670
OBC				0	6 667	6 667	6 667	0	0	0	0	0	0
Procurement				0	667	667	667	3 098	3 159	3 224	3 293	3 366	1 813
FBC				0	0	0	0	0	0	0	0	0	0
Execution				0	0	0	0	0	0	0	0	0	0
Grand total				0	21 500	21 500	21 500	12 353	13 261	13 587	13 935	14 303	8 484

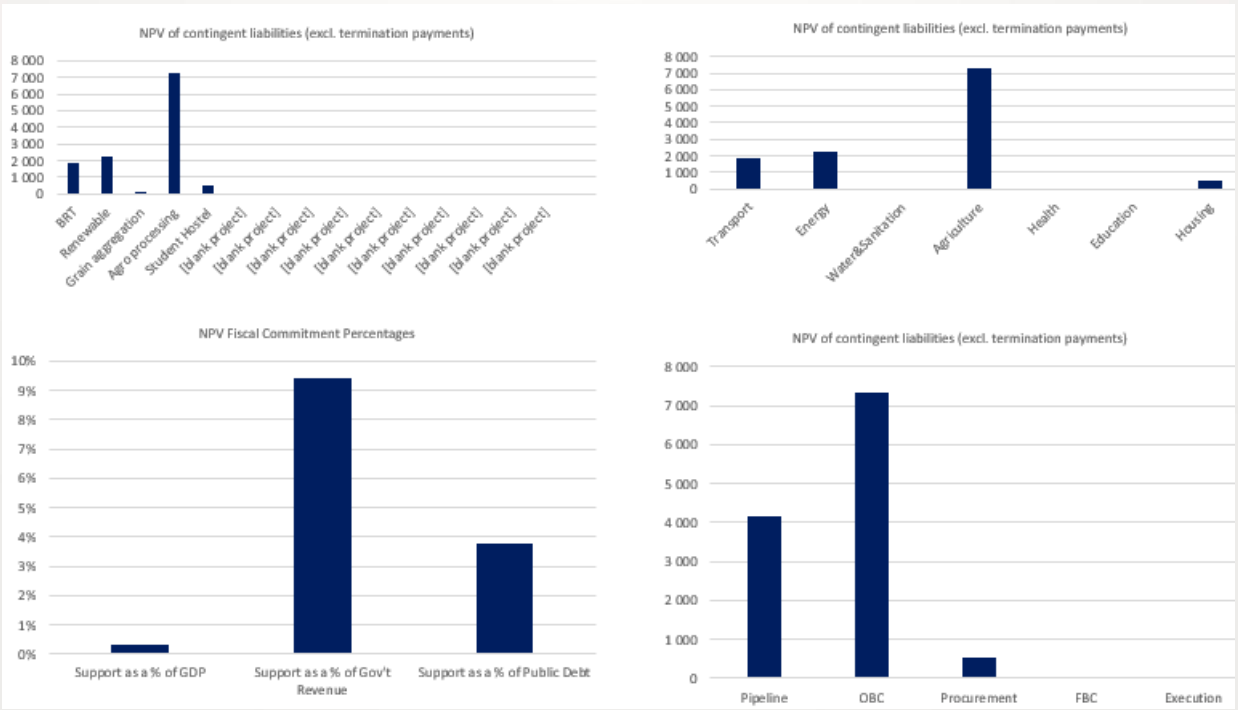


These annual analyses are completed by NPV[1] calculations in the “Dashboard-Totals” sheet

Figure 0-3: Total Dashboard output examples

Net contingent liabilities (excl. termination payments)

Project outputs									Macroeconomic assumptions		
Project number	Project name	Sector	Project Status	Year of assessment	NPV of contingent liabilities (excl. termination payments)	Support as a % of GDP	Support as a % of Gov't Revenue	Support as a % of Public Debt	GDP in assesment year	Gov't revenue in assesment year	Public debt in assesment year
P1	BRT	Transport	Pipeline	2021	1 893	0,0%	1,5%	0,6%	3 843 410	126 350	318 230
P2	Renewable	Energy	Pipeline	2021	2 253	0,1%	1,8%	0,7%	3 843 410	126 350	318 230
P3	Grain aggregation	Agriculture	OBC	2021	50	0,0%	0,0%	0,0%	3 843 410	126 350	318 230
P4	Agro processing	Agriculture	OBC	2021	7 276	0,2%	5,7%	2,3%	3 843 410	126 350	318 230
P5	Student Hostel	Housing	Procurement	2021	515	0,0%	0,4%	0,2%	3 843 410	126 350	318 230
P6	[blank project]										
P7	[blank project]										
P8	[blank project]										
P9	[blank project]										
P10	[blank project]										
P11	[blank project]										
P12	[blank project]										
P13	[blank project]										
P14	[blank project]										
P15	[blank project]										
[additional projects]											
Sub-total by sector											
Transport					1 893	0,0%	1,5%	0,6%			
Energy					2 253	0,1%	1,8%	0,7%			
Water&Sanitation					0	0,0%	0,0%	0,0%			
Agriculture					7 326	0,2%	5,8%	2,3%			
Health					0	0,0%	0,0%	0,0%			
Education					0	0,0%	0,0%	0,0%			
Housing					515	0,0%	0,4%	0,2%			
Sub-total by implementation status											
Pipeline					4 147	0,1%	3,3%	1,3%			
OBC					7 326	0,2%	5,8%	2,3%			
Procurement					515	0,0%	0,4%	0,2%			
FBC					0	0,0%	0,0%	0,0%			
Execution					0	0,0%	0,0%	0,0%			
Grand total					11 989	0,3%	9,4%	3,8%			



Appendix A: Project Examples in LTFP Tool

Introduction

The following section outlines project examples included in the Long-Term Fiscal Planning (LTFP) Tool to demonstrate its functionality and application.

Project Concept Notes Provided by PLSIRA

As part of the information shared by the Plateau State Investment Promotion and Public Private Partnership Agency (PLSIRA) to support the development of the Plateau State Government (PLSG) FCCL Framework, Project Concept Notes (PCNs) for four priority projects were provided. These projects include:

1. Plateau Bus Rapid Transit
2. Plateau Renewable Energy
3. Grains Aggregation Centers
4. Green Agro-Allied Industrial Zone

These PCNs offer high-level conceptual data, including preliminary assessments of capital costs and revenue assumptions. This information was used to develop datasets for the "P#-Risk" and "P#-FCCL" sheets within the LTFP Tool

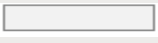
Illustrative Nature of Examples

It is important to note that the information provided by the PCNs is insufficient for a comprehensive FCCL assessment. As such, the examples in the Tool remain primarily illustrative. To demonstrate a different project type, a purely theoretical Public-Private Partnership (PPP) accommodation project has been added as Project P5.

Purpose of the Examples

This appendix provides additional details on these examples to:

- Illustrate how the LTFP Tool operates under different project structures (e.g., Government Availability or User Payments).
- Demonstrate the sequence of steps required to use the Tool effectively.
- Showcase the Tool's provisions for calculating FCCL based on indicative figures from selected projects.

These examples are instrumental in understanding the operationalization of the FCCL Framework within the context of Plateau State's fiscal planning. As indicated in Section 1.4.1, all input cells allow numeric inputs and are in orange colour  and users should input data in these cells as per guidance of the indicated units (date, amounts or %) in the adjacent cell. All pre-programmed computed cells are in grey colour  . These should not be modified by the user.

All Yes or No cell are equipped with a scroll down 

function:

Sequence of project inputs

The following table summarizes the sequence of tasks for entering project data into the tool's project sheets, as detailed in Section 3 of this Manual.

Task Number	Task Description	What	Why	Where
1	Input Basic Project Information	Enter the project name, sector, type, implementation status, and year of assessment.	Establish the foundational details of the project for identification and tracking purposes.	"P#-Risk" sheet.
2	Create New Project Sheets	Copy template sheets ("P#-Risk" and "P#-FCCL") and rename them for the new project (e.g., "P10-Risk" and "P10-FCCL").	Ensure a structured and consistent framework for the new project's data entry and analysis.	In the Excel Tool, under the sheet management section.
3	Populate Project-Specific Risk Data	Enter the project's risk matrix, including major risks, their likelihood, and impact.	Identify and assess critical risks to prepare for mitigation strategies.	"P#-Risk" sheet.
4	Enter Assumptions for FCCL Assessment	Provide financial and operational assumptions, such as revenue, cost, and risk parameters.	Enable accurate FCCL calculations and contingent liability assessments.	"P#-FCCL" sheet.
5	Review Pre-Formatted Outputs and Dashboards	Verify computed outputs and visual summaries for accuracy and completeness.	Ensure that the data analysis and outputs align with project expectations and standards.	Corresponding dashboard sheets within the Tool.
6	Finalize Project Data Entry	Cross-check inputs, ensure alignment with FCCL guidelines, and save the changes to the Tool.	Validate all entered data to maintain consistency and reliability in the Tool.	Across all sheets involved in the project data entry process.

P1 -
P1-Risk Sheet

Project Overview

P1 example is based on preliminary information received on Construction of Statewide Solar Power Grid[1]. First step is to fill in the Project Overview information in the Project Risk Sheet including the project payment structure. For the Water project, the assumption is that private partner's revenues will be based on users charge. Therefore, selection on the Project type cell to be chosen is "N".

Project Overview: Construction of Statewide Solar Power Grid[1]

Field	Example Value	Description
Project Name	Construction of Statewide Solar Power Grid	The title of the project being assessed.
Sector	Energy	The sector to which the project belongs.
Implementation Status	Preliminary Feasibility Study Completed	The current stage of the project.
Type of Project	Public-Private Partnership (PPP)	The financial or operational model used.

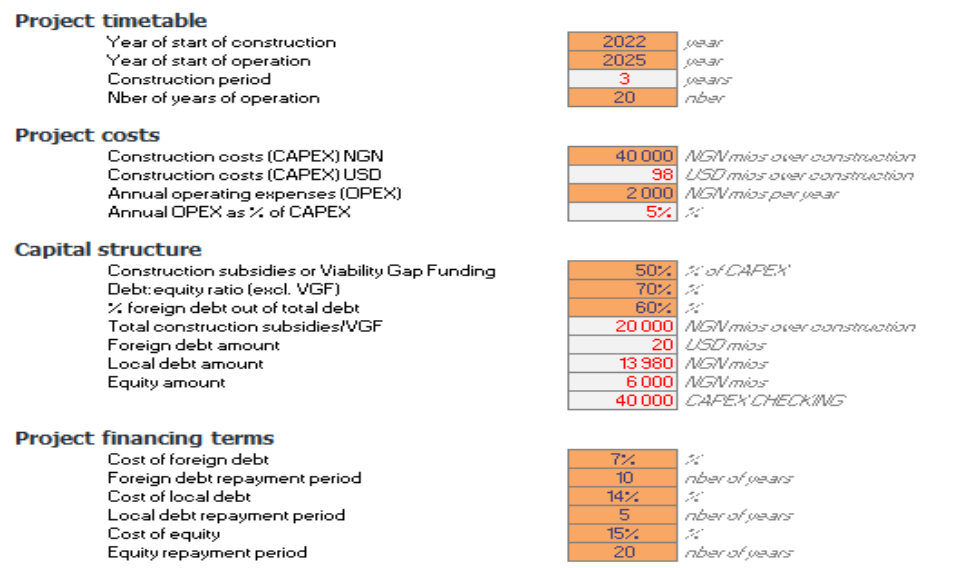
Year of Assessment	2024	The year in which the project's FCCL is being assessed.

P1-FCCL Sheet

Project Costs and Financing

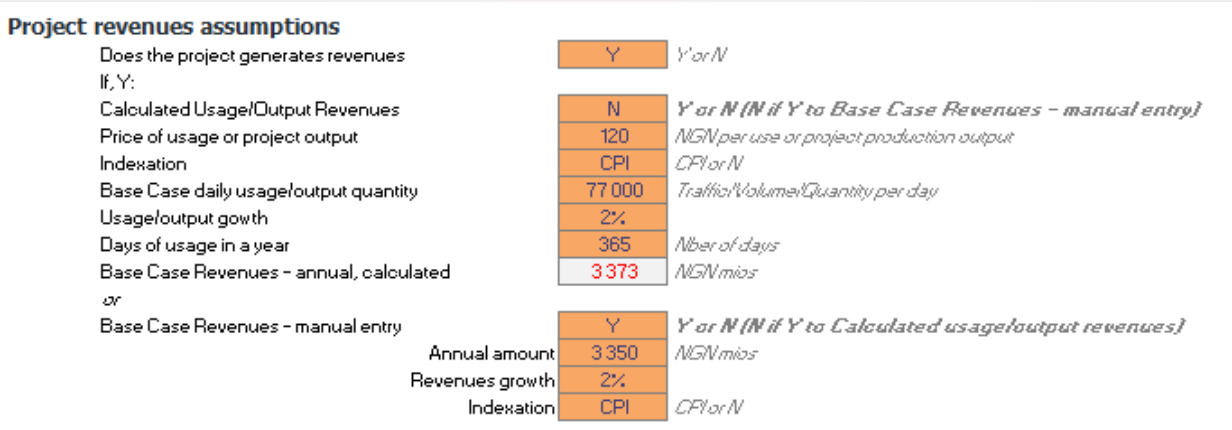
Other project data must be completed in the Project-FCCL sheet in accordance with section 3.2 of the Manual for FCCL calculations.

For the BRT, the assumptions regarding the project timetable, costs, capital structure and financing terms are as follows:



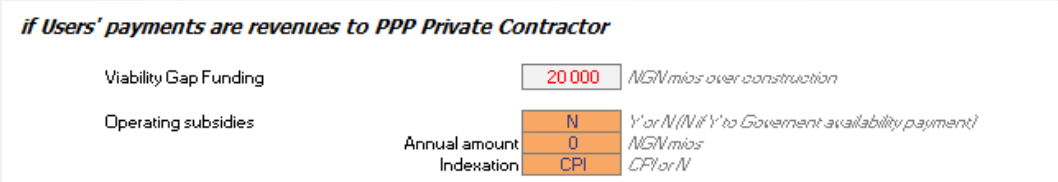
Project Revenues

The assumptions on revenues which are to be filled in for user's payment in accordance with instructions given in 3.2.3 for the Construction of Statewide Solar Power Grid[1] revenues are calculated based on a manual entry of an annual revenue which is indexed and grows by 2% per year.



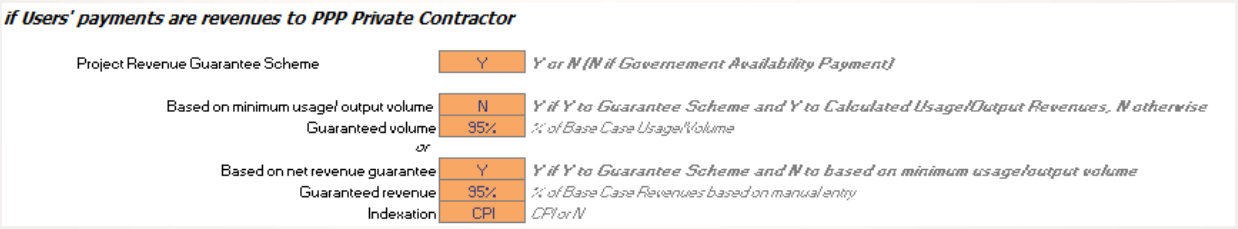
Fiscal Commitments

For users' payment structure, calculated FC can include VGF and operating subsidies as explained in section 3.2.4. For the BRT project, there are VGF FC calculated given the assumptions made (50% of CAPEX spread over the 3 year construction period) but no operating subsidy.



Contingent Liabilities

For the Construction of Statewide Solar Power Grid[1] , the assumptions include a guarantee of 95% Base revenues



This guarantee triggers a CL, which is calculated through MC simulations in the Monte Carlo Simulations sheet. The sheet assumes a triangular distribution for the adjustment factor profile, based on which forecasted revenues are calculated.

In the BRT example, a foreign exchange guarantee (on 100% of the foreign debt) is further assumed, which triggers a CL calculated through MC simulations in the Monte Carlo Simulations sheet.

CL linked to early termination risk is calculated as explained in section 3.4.2.

For the purpose of illustration, an additional CL based on 3% of CAPEX has been included during construction for geological risk.

P2 – Plateau State Renewable Energy Project
P2 Risk Sheet

Project Overview

P2 example is based on preliminary information received on the Plateau Renewable Energy Project (Renewable).

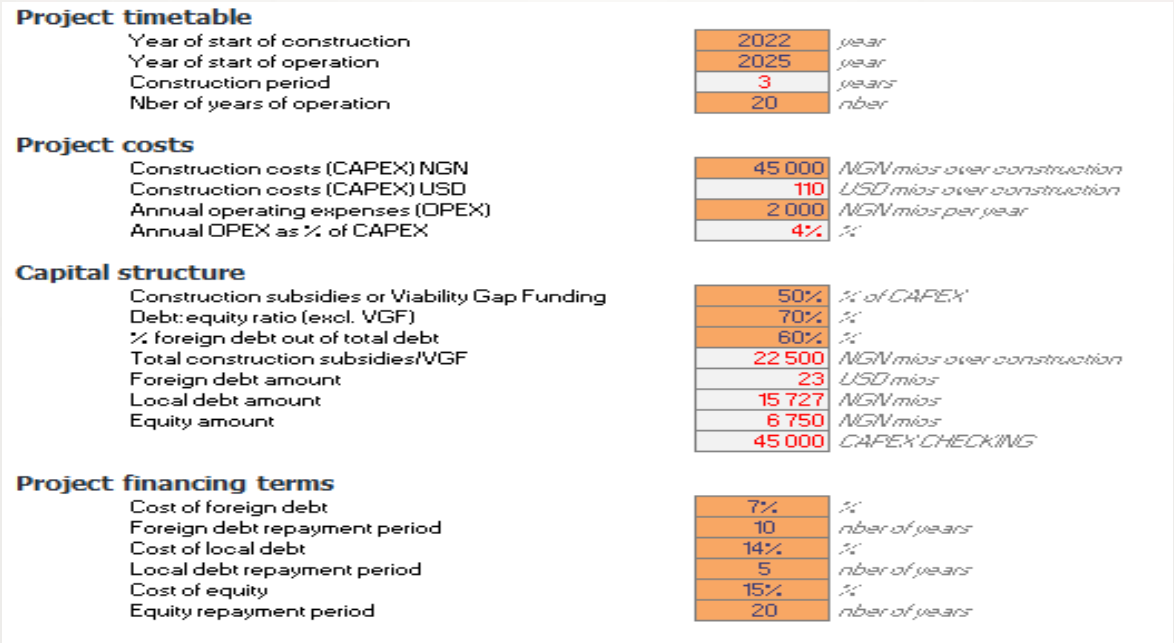
The first step is to fill in the Project Overview information in the Project Risk Sheet, including the project payment structure. For the Renewable project, the assumption is that private partners will receive payments based on a take or pay agreement, which is similar to Availability Payments. Therefore, selection on the Project type cell to be chosen is "Y".

P2-FCCL Sheet

Project Costs and Financing

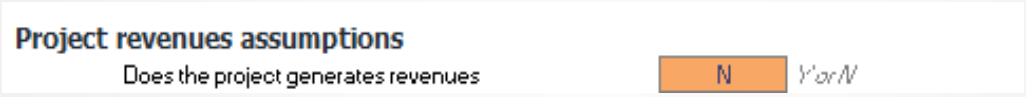
Other project data must be completed in the Project-FCCL sheet in accordance with section 3.2 of the Manual for FCCL calculations.

For the Renewable, the assumptions regarding the project timetable, costs, capital structure, and financing terms are as follows:



Project Revenues

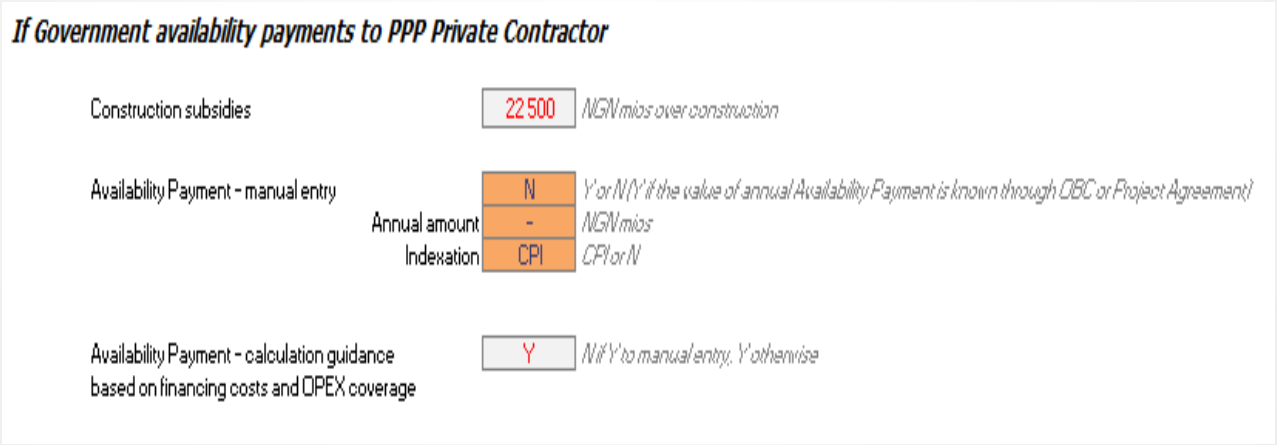
A project based on an availability payment structure can also generate revenues which will off-set availability payments. In this case, there are no other revenues than the payments made by the public authority for the electricity produced.



Fiscal Commitments

For an availability payment structure, the calculated FC can include Construction Subsidies, if any, and shall include availability payments according to the assumptions presented in section 3.2.4. For the Renewable project, FC is calculated in relation to Construction Subsidies given the assumptions made (50% of CAPEX spread over the 3-year construction period).

FC arising from availability payments are calculated based on financing costs and OPEX coverage.



Contingent Liabilities

There are no revenue or demand guarantees for an availability-based project. In the Renewable case, an FX guarantee is assumed, which triggers a CL calculation through MC simulations in the Monte Carlo Simulations sheet.

A CL linked to early termination risk is calculated as explained in section 3.4.2.

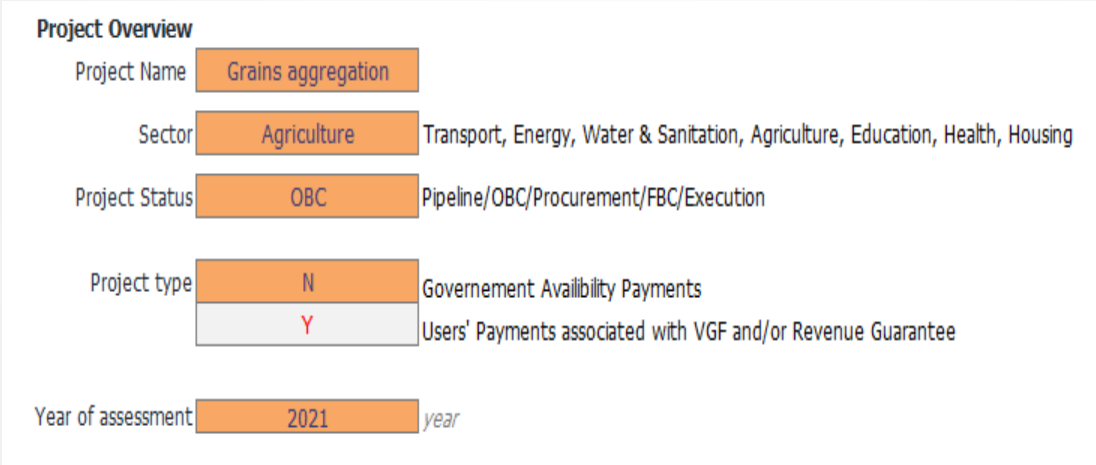
For the purpose of illustration, an additional CL has been included during construction for land acquisition risk based on 2% of CAPEX.

P3 – Plateau Grains Aggregation Centres
P3-Risk Sheet

Project Overview

The P3 example is based on preliminary information received on the Plateau Grains Aggregation Centres (Grains Aggregation) Project.

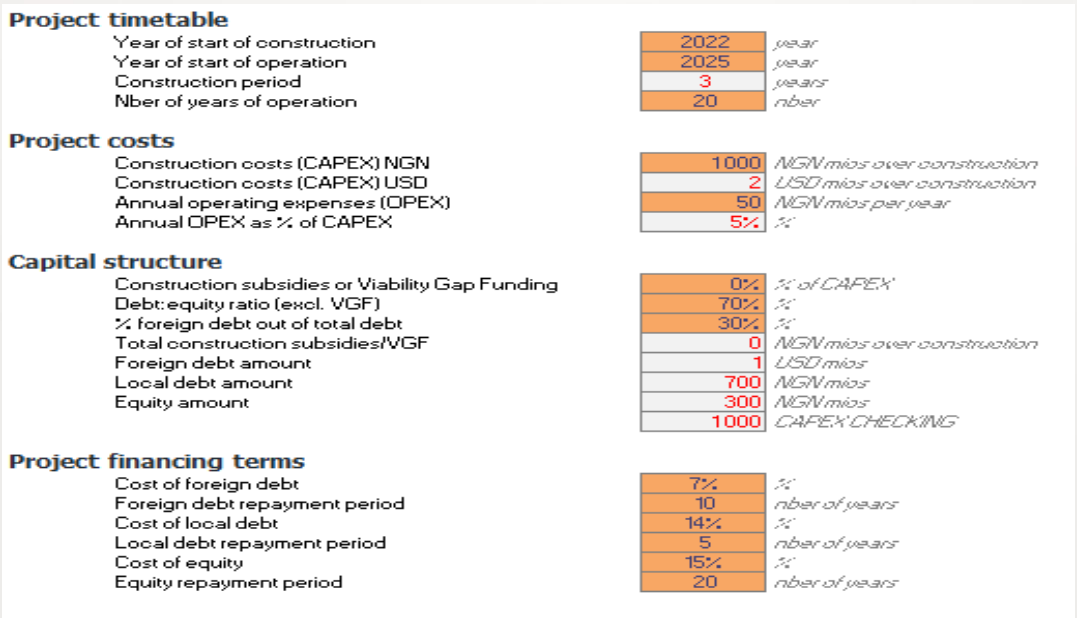
For this project, the assumption is that the private partner's revenues will be based on the sale of grains processed by the centres. Therefore, Project type selection is "N" on the P3-Risk Sheet.



P3-FCCL Sheet

Project Costs and Financing

For the Grains Aggregation Project, the assumptions regarding the project timetable, costs, capital structure and financing terms are as follows:



Project Revenues

In this case, revenues are calculated based on the daily output of the centres (45,000MT/day combined production of processed ginger/maize in accordance with PCN) and illustrative assumption made on price per T.

Project revenues assumptions

Does the project generates revenues	Y	Y or N
If, Y:		
Calculated Usage/Output Revenues	Y	Y or N (N if Y to Base Case Revenues - manual entry)
Price of usage or project output	20	NGN per use or project production output
Indexation	CPI	CPI or N
Base Case daily usage/output quantity	45 000	Traffic/Volume/Quantity per day
Usage/output gowth	2%	
Days of usage in a year	365	Nber of days
Base Case Revenues - annual, calculated	329	NGN mios
or		
Base Case Revenues - manual entry	N	Y or N (N if Y to Calculated usage/output revenues)
Annual amount	0	NGN mios
Revenues growth	2%	
Indexation	CPI	CPI or N

Fiscal Commitments

Calculated FC can include VGF and operating subsidies given the type of payment structure. None have been assumed for the grain aggregation project.

if Users' payments are revenues to PPP Private Contractor

Viability Gap Funding	0	NGN mios over construction
Operating subsidies	N	Y or N (N if Y to Govement availability payment)
Annual amount	0	NGN mios
Indexation	CPI	CPI or N

Contingent Liabilities

For the Grains aggregation, the assumptions include a guarantee of 95% daily output offtake.

if Users' payments are revenues to PPP Private Contractor

Project Revenue Guarantee Scheme	Y	Y or N (N if Government Availability Payment)
Based on minimum usage/ output volume	Y	Y if Y to Guarantee Scheme and Y to Calculated Usage/Output Revenues, N otherwise
Guaranteed volume	95%	% of Base Case Usage/Volume
or		
Based on net revenue guarantee	N	Y if Y to Guarantee Scheme and N to based on minimum usage/output volume
Guaranteed revenue	100%	% of Base Case Revenues based on manual entry
Indexation	CPI	CPI or N

This market-based guarantee triggers a CL which, in this case, for illustration purpose, is calculated based on a manually entered adjustment factor.

Adjustment factors in use	Manual
Base Guaranteed Revenue	
Market Based Revenues (Usage Volume Based Revenues)	
Foreign Exchange	

It is further assumed in the Grain aggregation example that there is a foreign exchange guarantee (on 100% of the foreign debt), which triggers a CL calculated through MC simulations in the Monte Carlo Simulations sheet.

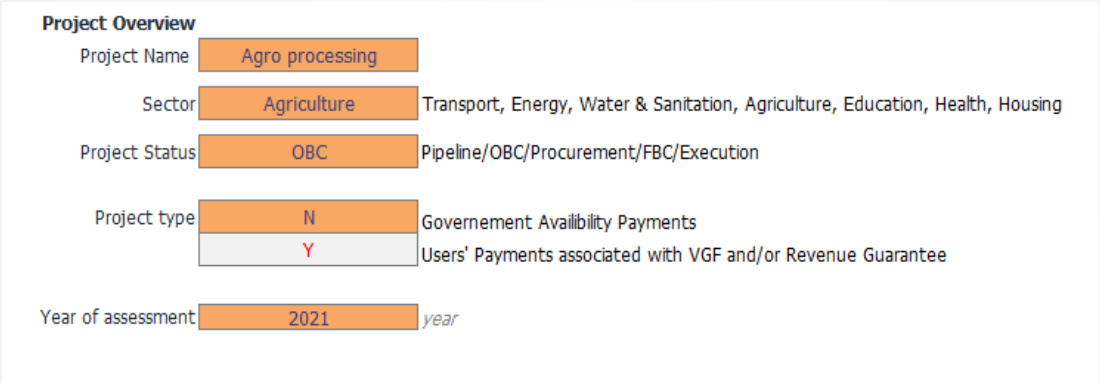
A CL linked to early termination risk is calculated as explained in section 3.4.2

P4 - Green Agro-Allied Industrial Zone
P4-Risk Sheet

Project Overview

P4 example is based on preliminary information received on the Green Agro-Allied Industrial Zone Project.

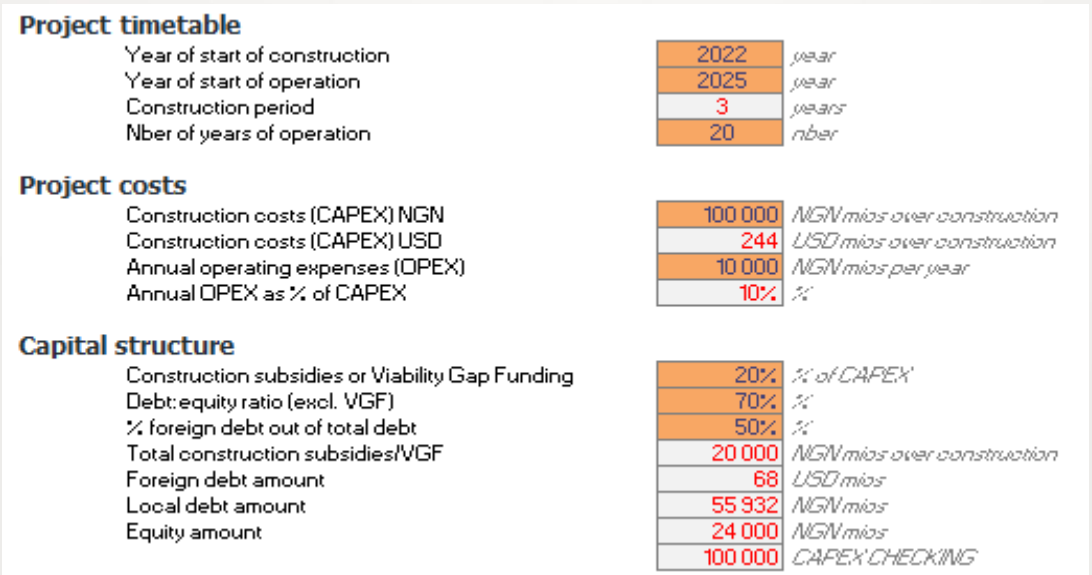
For this project, the assumption is that the private partner's revenues will be based on payments received by the industrial zone users. Therefore, the Project type selection is "N" on the P4-Risk Sheet.



P4-FCCL Sheet

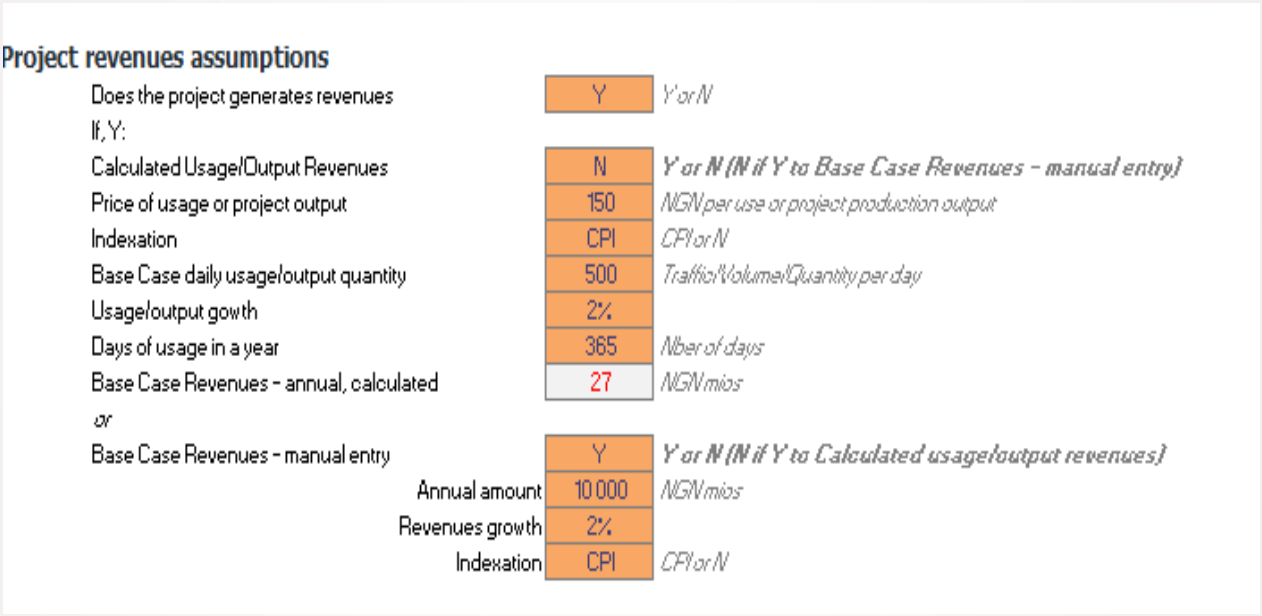
Project Costs and Financing

For this project, the assumptions regarding the project timetable, costs, capital structure, and financing terms are as follows:



Project Revenues

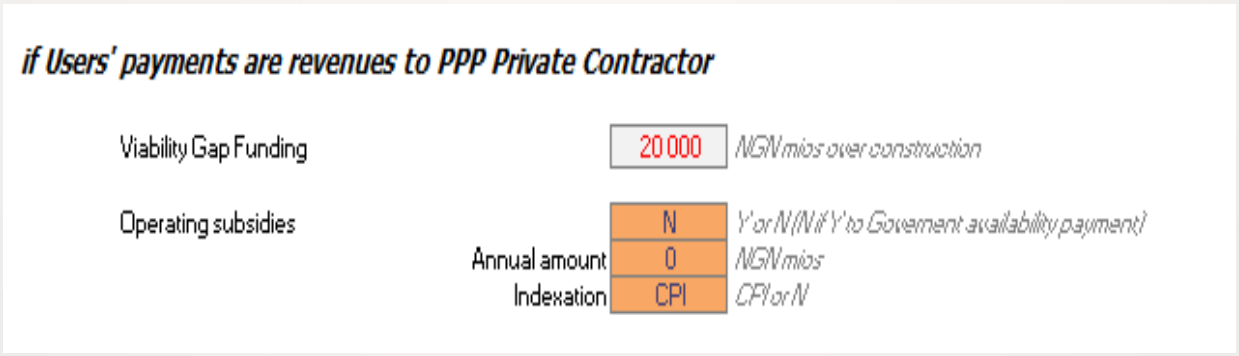
In this case, revenues are calculated based on a manual entry for initial annual revenue to which is applied a growth rate (2%) and inflation (CPI).



Project revenues assumptions		
Does the project generates revenues	Y	Y or N
If, Y:		
Calculated Usage/Output Revenues	N	Y or N (N if Y to Base Case Revenues - manual entry)
Price of usage or project output	150	NGN per use or project production output
Indexation	CPI	CPI or N
Base Case daily usage/output quantity	500	Traffic/Volume/Quantity per day
Usage/output gowth	2%	
Days of usage in a year	365	Nber of days
Base Case Revenues - annual, calculated	27	NGN mios
or		
Base Case Revenues - manual entry	Y	Y or N (N if Y to Calculated usage/output revenues)
Annual amount	10 000	NGN mios
Revenues growth	2%	
Indexation	CPI	CPI or N

Fiscal Commitments

Calculated FC can include VGF and operating subsidies given the type of payment structure. For this example, VGF FC is calculated given the assumptions made (20% of CAPEX spread over the 3-year construction period) but no operating subsidies.



if Users' payments are revenues to PPP Private Contractor		
Viability Gap Funding	20 000	NGN mios over construction
Operating subsidies	N	Y or N (N if Y to Govement availability payment)
Annual amount	0	NGN mios
Indexation	CPI	CPI or N

Contingent Liabilities

For this project, the assumptions include a guarantee of 95% Base revenues.

if Users' payments are revenues to PPP Private Contractor		
Project Revenue Guarantee Scheme	Y	Y or N (N if Government Availability Payment)
Based on minimum usage/ output volume	N	Y if Y to Guarantee Scheme and Y to Calculated Usage/Output Revenues, N otherwise
Guaranteed volume	95%	% of Base Case Usage/Volume
or		
Based on net revenue guarantee	Y	Y if Y to Guarantee Scheme and N to based on minimum usage/output volume
Guaranteed revenue	95%	% of Base Case Revenues based on manual entry
Indexation	CPI	CPI or N

This guarantee triggers a CL calculated through MC simulations in the Monte Carlo Simulations sheet assuming a normal distribution for the adjustment factor profile based on which forecasted volumes are calculated.

In this example, a foreign exchange guarantee (on 100% of the foreign debt) is further assumed, which triggers a CL calculated through MC simulations in the Monte Carlo Simulations sheet.

A CL linked to early termination risk is calculated as explained in section 3.4.2.

P5 – Student Hostel

P5 sheets present a theoretical example of an availability-based payment structure including project revenue. This could apply for instance to a student accommodation developed on a PPP basis where the private partner receives availability payments from the public authority whereas this public authority collects rent from the students.

P5-Risk Sheet

Project Overview

Project type selection is “Y” on the P5-Risk Sheet.

Year	e (NGN mi	re (NGN r	NGN mios	bt to GDP	Revenue	xpenditur	G Debt (U	SG GDP (USD)
2024	8	7.5	5	35	1000	950	2000	5700
2025	8.5	8	5.5	34.5	1080	1020	2100	5900
2026	9	8.5	6	34	1165	1100	2220	6100
2027	9.2	9	6.5	33.5	1250	1200	2350	6300
2028	9.5	9.5	6.8	33	1350	1300	2500	6500
2029	10	9.8	7	32.8	1450	1400	2650	6700
2030	10.2	10	7.2	32.5	1550	1500	2800	6900
2031	10.5	10.2	7.5	32.2	1650	1600	2950	7100
2032	10.7	10.4	7.7	32	1760	1700	3100	7300
2033	11	10.5	8	31.8	1880	1800	3250	7500

P5-FCCL Sheet

<u>Project Costs and Financing</u>

Theoretical assumptions regarding the project timetable, costs, capital structure and financing terms are as follows:

Project timetable		
Year of start of construction	2022	year
Year of start of operation	2025	year
Construction period	3	years
Nber of years of operation	20	nber
Project costs		
Construction costs (CAPEX) NGN	10 000	NGN mios over construction
Construction costs (CAPEX) USD	24	USD mios over construction
Annual operating expenses (OPEX)	500	NGN mios per year
Annual OPEX as % of CAPEX	5%	%
Capital structure		
Construction subsidies or Viability Gap Funding	20%	% of CAPEX
Debt: equity ratio (excl. VGF)	70%	%
% foreign debt out of total debt	50%	%
Total construction subsidies/VGF	2 000	NGN mios over construction
Foreign debt amount	7	USD mios
Local debt amount	5 593	NGN mios
Equity amount	2 400	NGN mios
	10 000	CAPEX CHECKING
Project financing terms		
Cost of foreign debt	7%	%
Foreign debt repayment period	10	nber of years
Cost of local debt	14%	%
Local debt repayment period	5	nber of years
Cost of equity	15%	%
Equity repayment period	20	nber of years

Project Revenues

Rent collected by the public authority, and off-setting of the availability payment, are calculated based on usage and tariff assumptions.

Project revenues assumptions		
Does the project generates revenues	Y	Y or N
If, Y:		
Calculated Usage/Output Revenues	Y	Y or N (N if Y to Base Case Revenues - manual entry)
Price of usage or project output	150	NGN per use or project production output
Indexation	CPI	CPI or N
Base Case daily usage/output quantity	500	Traffic/Volume/Quantity per day
Usage/output gowth	2%	
Days of usage in a year	365	Nber of days
Base Case Revenues - annual, calculated	27	NGN mios
or		
Base Case Revenues - manual entry	N	Y or N (N if Y to Calculated usage/output revenues)
Annual amount	0	NGN mios
Revenues growth	2%	
Indexation	CPI	CPI or N

Fiscal Commitments

In this theoretical case, FC include Construction Subsidies (20% of CAPEX spread over the 3 year construction period). FC arising from availability payment are calculated based on financing costs and OPEX coverage and offset by project revenues adjusted using MC simulations

FISCAL COMMITMENTS	Years		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
If Government availability payment to PPP Private Contractor												
Construction subsidies			0	667	667	667	0	0	0	0	0	0
Availabilty Payments – manual entry	N		0	0	0	0	0	0	0	0	0	0
Availabilty Payments – guidance calculation	Y											
Availabilty Payments covering financing	*NGN'mios*		0	0	0	0	2 479	2 498	2 517	2 537	2 558	951
Availabilty Payments covering OPEX	*NGN'mios*		0	0	0	0	655	701	750	803	859	919
Total Availability Payments	*NGN'mios*		0	0	0	0	3 134	3 199	3 267	3 340	3 417	1 870
Project Revenues – Availability Payments Offsets	Y											
Base Case Revenue – manual entry	*NGN'mios*		0	0	0	0	0	0	0	0	0	0
Base Case Revenue – calculated	*NGN'mios*		0	0	0	0	37	40	44	48	52	57
Base Case Usage or Volume output – calculated	*per day*		0	0	0	0	510	520	531	541	552	563
Price of usage/Tariff	*NGN*		0	0	0	0	197	210	225	241	258	276
Availabilty Payment Offsets based on Project Revenue Profile	*NGN'mios*		0	0	0	0	37	42	46	52	58	63
Net Fiscal Commitments (GAP scheme)	*NGN'mios*		**0**	**667**	**667**	**667**	**3 098**	**3 157**	**3 221**	**3 288**	**3 359**	**1 807**
NPV of Net Fiscal Commitments (GAP scheme)		14 979										

Contingent Liabilities

In this theoretical case there are also CL in relation to FX guarantee calculated using MC simulations and CL linked to early termination risk calculated as explained in section 3.4.2.

			Years		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Foreign exchange rate guarantee														
Shortfall payment consequent to NGN depreciation scenario	*NGN'mios*		0	0	0	0	16	9	15	27	23	33	35	42
Termination payments														
Compensation on termination	*NGN'mios*		0	3 795	7 668	11 623	10 637	9 498	8 184	6 669	4 927	4 556	4 118	3 604
Weighted termination payments (Probability of default adjusted)	*NGN'mios*		0	493	997	1 511	1 383	1 235	1 064	867	641	592	535	468
NPV of weighted termination payments (NGN mios)	*NGN'mios*	5 532	0	3 795	5 532	5 532	5 532	5 532	5 532	5 532	4 927	4 556	4 118	3 604

Appendix B Monte Carlo simulations and probability distributions

Monte Carlo Simulations

As indicated in section 3.3, Monte Carlo simulation is a modelling technique consisting in generating random variables on the basis of probability distributions The Tool includes the flexibility to run MC simulations using three types of distributions:

- a triangular distribution;
- a normal distribution; and
- a geometric Brownian motion process.

The MC simulation in the Tool consists in calculating 1,000 annual growth rate profiles from 1,000 random probability draws based on one of the available distributions.

The average of the 1,000 calculated growth rates profiles (based on random probabilities draws and a given distribution) is then used as the annual growth rate forecast for 4 different streams of figures, when relevant depending on the project structure and assumptions:

- guaranteed revenue or guaranteed volume for users' payment structure;
- revenue forecast offsetting availability payment in the AP structure;
- FX rate in case of FX rate guarantee.

Each forecast profile is derived from the annual growth rates established by the MC simulation and a first-year value based on the project assumptions. It is then compared with the base case assumptions to arrive at the adjustment factors used for assessing the associated Contingent Liability.

Before running a MC simulation on a given profile, the user must choose between the 3 types of probability distributions and fill in their parameters.

Project revenues simulations

Distribution parameters - Base Guaranteed Revenue

	Optimistic Sc	Base Case	Downside Sc	Mean	Std. Dev	Drift	Volatility
Triangle distribution (1)	15%	3%	3%				
Normal distribution (1)				3%	3%		
Geometric Brownian Motion (1)				0,00	1,00	3%	3%
Distribution Selected	Triangle distribution (1)						
Distribution Selected (number)	1						

Distribution parameters - Market Based Revenues (Usage Volume Based Revenues)

	Optimistic Sc	Base Case	Downside Sc	Mean	Std. Dev	Drift	Volatility
Triangle distribution (2)	4%	2%	0%				
Normal distribution (2)				2%	2%		
Geometric Brownian Motion (2)				0,00	1,00	2%	2%
Distribution Selected	Normal distribution (2)						
Distribution Selected (number)	2						

Foreign exchange rate guarantee

	Optimistic Sc	Base Case	Downside Sc	Mean	Std. Dev	Drift	Volatility
Triangle distribution (3)	0%	4%	8%				
Normal distribution (3)				4%	2%		
Geometric Brownian Motion (3)				0,00	1,00	4%	2%
Distribution Selected	Geometric Brownian Motion (3)						
Distribution Selected (number)	3						

Distribution parameters - Availabilty Payment Offsets based on Project Revenue Profile

	Optimistic Sc	Base Case	Downside Sc	Mean	Std. Dev	Drift	Volatility
Triangle distribution (4)	4%	2%	0%				
Normal distribution (4)				2%	2%		
Geometric Brownian Motion (4)				0,00	1,00	2%	2%
Distribution Selected	Triangle distribution (4)						
Distribution Selected (number)	1						

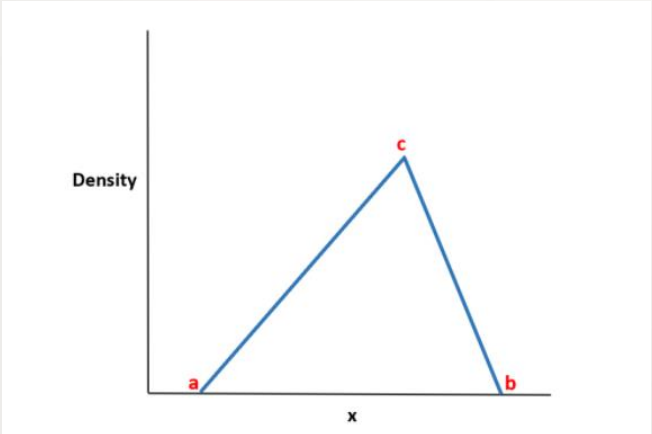
The purpose of this Appendix is to present the available probability distributions and provide guidance on how to determine their parameters.

Triangular distribution

The triangular distribution is a continuous probability distribution with a probability density function shaped like a triangle. It is defined by three values:

1. The minimum value a
2. The maximum value b
3. The peak value c

The name of the distribution comes from the fact that the probability density function is shaped like a triangle, as shown in the figure below.



This distribution is especially relevant when we can estimate the minimum value a, the maximum value b, and the most likely value c that a random variable will take on, so we can model the behavior of random variables by using a triangular distribution with the knowledge of just these three values.

In the Tool, these values are named as follows:

a: Pessimistic Scenario

b: Optimistic scenario

c: Base Case

The values of a, b, and c represent growth rates for the given variable of interest. For example, if the user inputs a value of 2% for the Base Case (a) assumption for the availability payments, this would imply a base case assumption of 2% annual growth.

To calculate the growth rate (X) in given year, the model uses a formula derived from the cumulative distribution function (CDF). For a given draw of a random variate (U) from a uniform distribution in the interval (0,1) (derived using the "RAND()" function in Excel), the formula for calculating the annual growth rate is as below. This calculation is done independently for each year.

$$X = \begin{cases} a + \sqrt{U * (b-a) * (c-a)}, & \text{for } 0 < U < \dfrac{c-a}{b-a} \\ b - \sqrt{(1-U) * (b-a) * (b-c)}, & \text{for } \dfrac{c-a}{b-a} < U < 1 \end{cases}$$

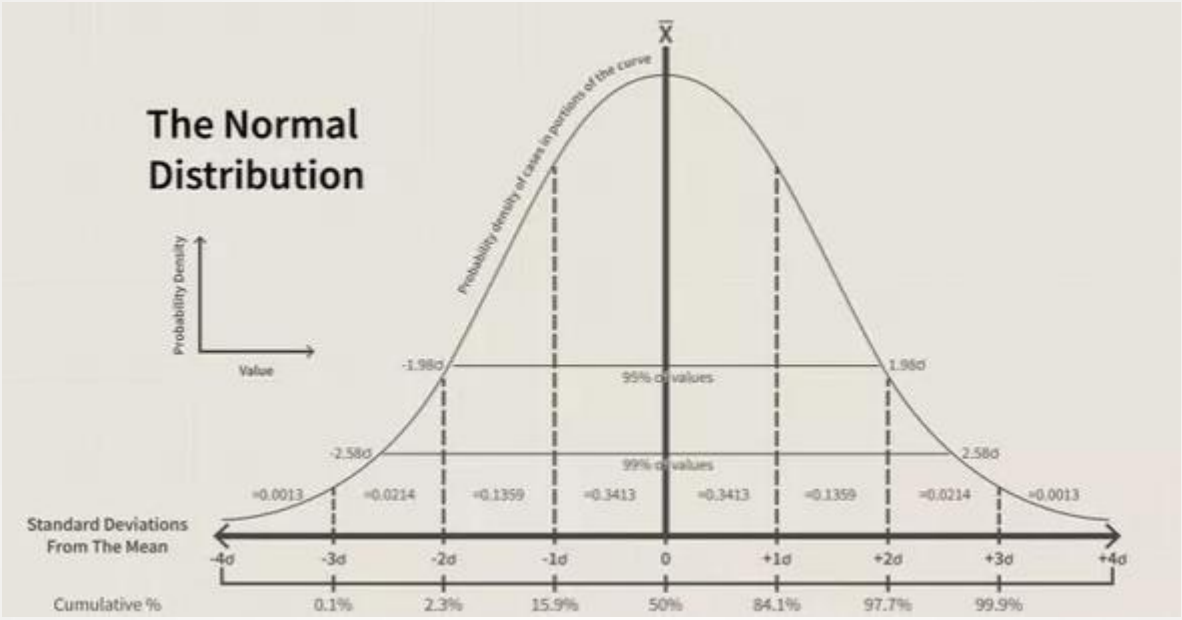
Typically for revenue growth simulation, the variable a will be the base case assumption (for instance CPI + Base case growth), b the best case growth anticipation and c the worst case one.

Normal distribution

Normal distribution, also known as the Gaussian distribution, is a probability distribution that is symmetric about the mean, showing that data near the mean are more frequent in occurrence than data far from the mean. In graph form, normal distribution will appear as a bell curve (as shown in the figure below).

The normal distribution is the most common type of distribution assumed in statistical analyses. The standard normal distribution has two parameters: the mean m and the standard deviation sd.

For a normal distribution, 68% of the observations are within +/- one standard deviation of the mean, 95% are within +/- two standard deviations, and 99.7% are within +- three standard deviations.

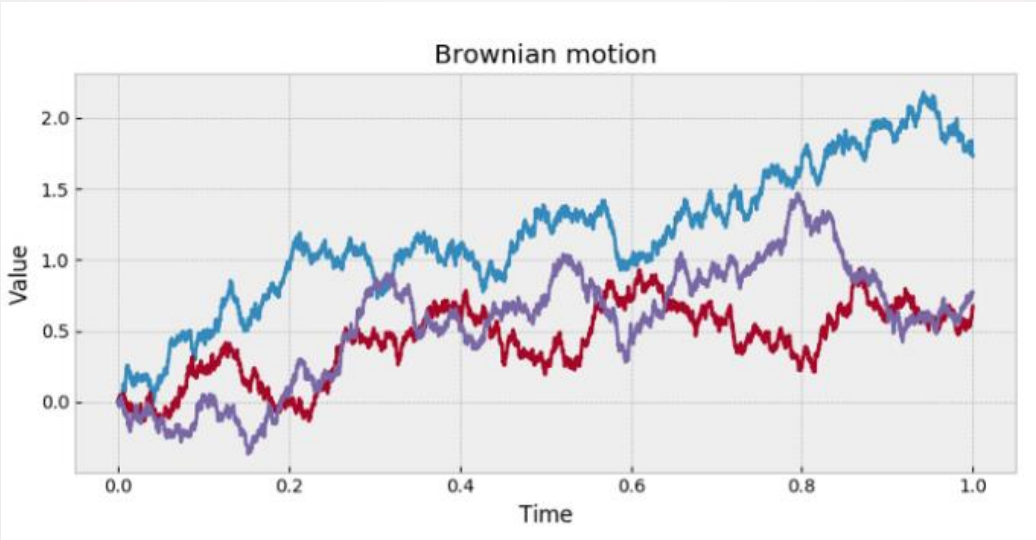


The tool uses the Excel formula NORM to calculate growth rates based on the normal distribution. NV returns, for a given probability (selected using the RAND() function), the value of a random variable following a normal distribution for the mean and the specified standard deviation. In other words, it is the inverse of the CDF for a normal distribution.

Typically, the mean will be the base case growth rate when using the normal distribution. For example, volume growth guarantees an anticipated market growth of 2%. The choice of SD will be based on the expected variation around this base case growth.

Geometric Brownian Motion

A geometric Brownian motion (GBM) is a continuous-time stochastic process in which the logarithm of the randomly varying quantity follows a Brownian motion with drift.



GBM is a typical example of stochastic processes. A stochastic process is a collection of random variables: a variable x at time t is a random variable, i.e. the outcome of a hypothetical random

Experiment, then a collection of these outcomes, for each time period t, gives us a stochastic process.

Stochastic process such as GBM are often used in finance, in particular for establishing stock prices forecasts.

At a given year (t) the growth rate (g(t)), when a GBM is assumed, is calculated using the following formula:

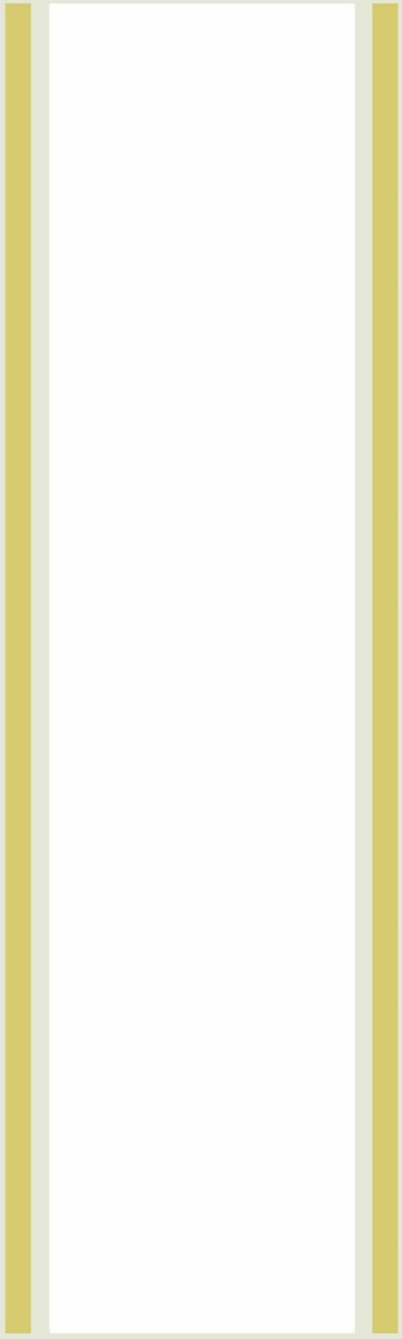
$$g(t) = e^{\left(\mu - \frac{\sigma^2}{2}\right)t + \sigma Z} - 1$$

Where:

- μ = drift
- σ = volatility
- z = normally distributed random variable with mean 0 and variance 1 based on the probability draw in year t (calculated using the NORM.INV and RAND () Excel functions, as discussed in the previous section).

The drift μ corresponds to the base case growth. The volatility δ translates the anticipated variation around the base case growth. This is the same calibration as discussed in the previous section.

Based on its typical use in the financial markets, the GBM can typically be chosen for the MC simulation for the calculation of CL related to FX guarantee.

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