



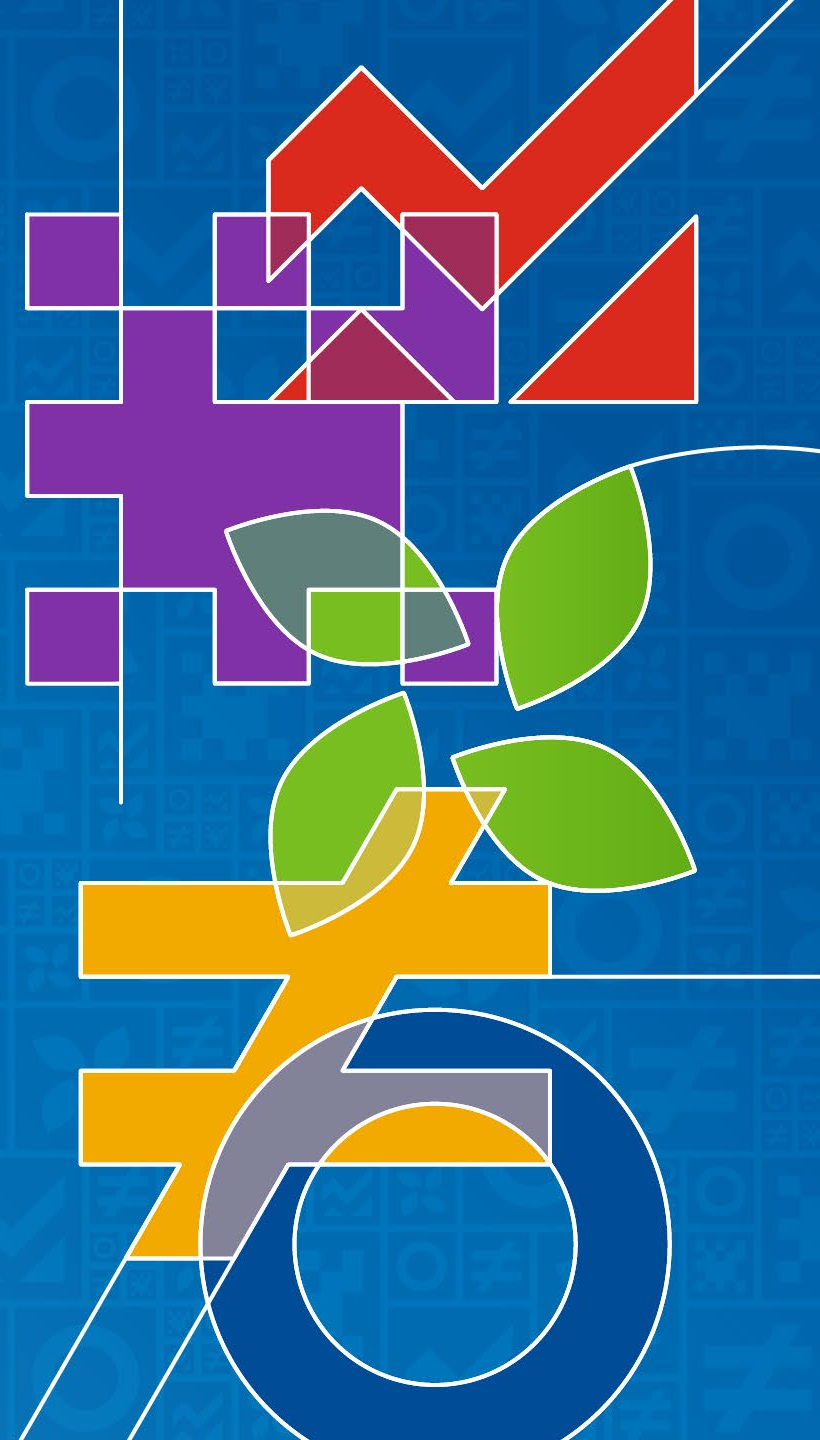
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Developing Capacity for Public Debt Projections and Analysis with the Public Debt Dynamics Tool (DDT)

APRIL 10, 2023

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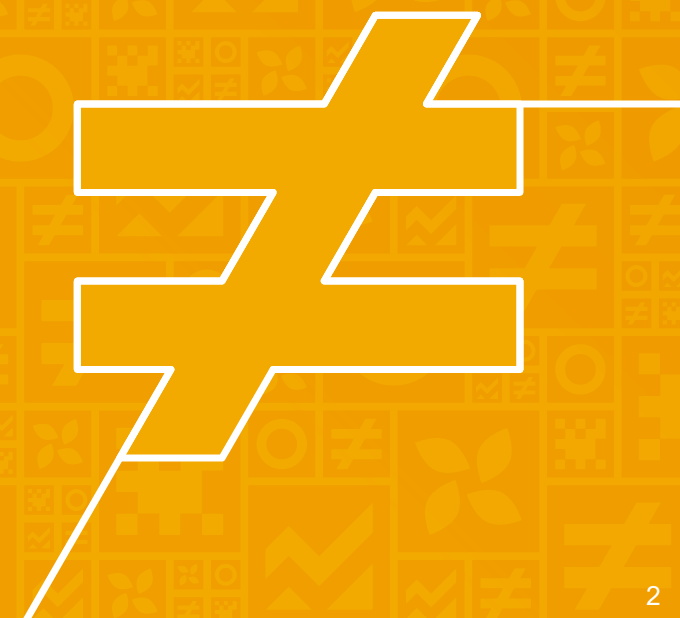
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What is the Public Debt Dynamics Tool (DDT)?



The Public Debt Dynamics Tool (DDT) is a **simple** Excel-based tool that projects the **public debt-to-GDP ratio** under a baseline and **alternative scenarios**.

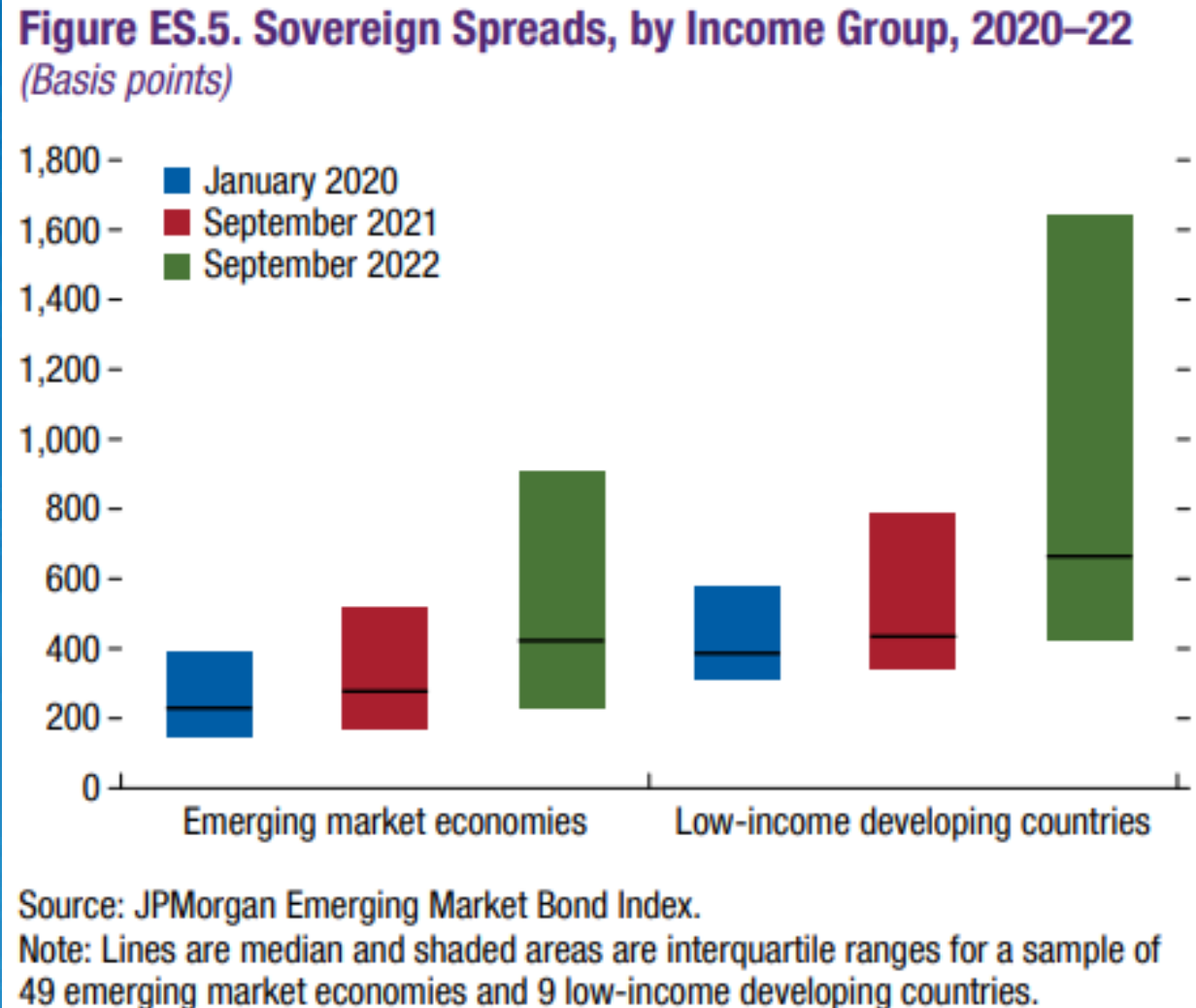
Because of its simplicity, the DDT is useful for **helping countries develop capacity** on public debt projections and analysis.

Realism and Fiscal Adjustments	
debt levels in 2026: historical and constant pb scenarios	
74.8	84.6
debt-stabilizing primary balance in 2021 and in 2026	
0.0	0.7
level and yearly change of the primary balance that yield a 60% debt ratio in 2035 7/	
1.0	0.1
probability of debt below: end-2020 and 60 percent in 2035	
28.7	31.7

<https://bit.ly/DDT2023>



Projecting public debt levels under different scenarios is a key step for understanding the risk of debt distress



The Public Debt Dynamics Tool (DDT) requires data for **only 10 variables**, easily obtained from fiscal accounts or published reports.

Historical Data and Forecasts. Variables in percent or percent of GDP, unless otherwise indicated. Country: Macondo													
Year/Variable	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	First Year of Projection 2021	2022	2023
d_t (debt including uncalled guarantees): Stock of total gross public debt, percent of GDP	31.59	35.34	43.12	44.44	44.33	45.98	47.44	48.55	48.67	58.86			
<i>o/w stock of local-currency guarantees (uncalled)</i> : Stock of uncalled guarantees in local currency included in total debt, percent of GDP	0.00	0.00	0.00	0.00	0.00	0.36	0.14	0.11	0.95	0.82	0.57	0.50	0.44
<i>o/w stock of foreign-currency guarantees (uncalled)</i> : Stock of uncalled guarantees in foreign currency included in total debt, percent of GDP	0.00	0.00	0.00	0.00	0.00	1.07	0.41	0.34	2.86	2.46	1.71	1.50	1.32
α_t (share excl. guarantees): Share of foreign currency denominated debt in total debt, percent of total debt	55.05	58.87	69.61	68.47	67.99	63.36	64.18	61.20	60.67	60.45	63.47	63.47	60.30
e_t (LCU/FCU, avg): Nominal average exchange rate, local currency per unit of foreign currency	18.92	19.50	20.36	20.99	21.95	22.84	23.49	23.90	24.51	24.58	24.21	24.38	24.71
e_t (LCU/FCU, eop): Nominal end-of-period exchange rate, local currency per unit of foreign currency	19.05	19.96	20.60	21.51	22.37	23.50	23.59	24.34	24.64	24.11	24.30	24.47	24.96
i_t^d : Nominal effective interest rate on local currency denominated debt, percent	8.92	9.23	10.53	10.85	10.95	10.10	9.70	10.16	10.21	10.39	9.87	9.38	9.84
i_t^f : Nominal effective interest rate on foreign currency denominated debt, percent	2.46	2.03	2.80	3.41	3.51	3.50	3.87	3.61	3.58	3.60	3.78	3.78	3.59
π_t : GDP deflator inflation, percent	5.60	5.39	4.92	5.82	2.36	3.31	4.73	4.23	4.08	4.01	4.04	3.65	3.76
g_t : Real GDP growth, percent	3.84	4.13	2.79	3.06	3.84	3.89	4.84	3.85	2.66	-8.99	4.23	3.75	3.41
pb_t : Primary balance, percent of GDP	-3.28	-4.03	-5.61	-1.88	-0.35	-0.13	0.02	0.85	0.56	-3.55	-4.04	-1.05	0.45
of_t : Other net debt-creating flows, percent of GDP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.90	0.90
π_t^f : Foreign GDP deflator inflation, percent (used in fan chart)	2.09	1.92	1.75	1.85	0.95	1.05	1.88	2.40	1.79	1.41	2.21	1.78	1.81



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Why do we use the Public Debt Dynamics Tool (DDT)?



The LIC DSF (Debt Sustainability Framework for Low-Income Countries) and SRDSF (Sovereign Risk and Debt Sustainability Framework for Market Access Countries) are the **official IMF tools** for projecting public debt and **debt sustainability analysis**

STAFF GUIDANCE NOTE ON THE SOVEREIGN RISK AND DEBT SUSTAINABILITY FRAMEWORK FOR MARKET ACCESS COUNTRIES

EXECUTIVE SUMMARY

This note provides operational guidance for the use of the Sovereign Risk and Debt Sustainability Framework (SRDSF), which replaces the Debt Sustainability Framework for Market Access Countries. The SRDSF introduces improvements in organization, methodology, transparency, and communication when analyzing public debt issues in countries that mainly finance themselves with market-based debt. After its phased adoption beginning [June 2022], it will become the Fund's principal tool for assessing public debt sustainability.



Online: Debt Sustainability Framework for Low Income Countries (LIC DSFX)

The Public Debt Dynamics Tool (DDT) is a **much simpler** tool that requires much less data.

Because of the DDT's **more limited scope** (e.g., the DDT does not produce a debt sustainability assessment)

Because the DDT projects public debt using **fiscal balance projections** instead of the more difficult to obtain projections of issuances and amortizations

Even with a different approach, the Public Debt Dynamics Tool (DDT) can replicate the baseline public debt projections of the **LIC DSF** and the **SRDSF**, and thus the DDT can be a **steppingstone for understanding** these more comprehensive frameworks.

	Debt and Economic Indicators ^{1/}									
	Actual		Est.	Projections						
	2012-2018 ^{2/}	2019	2020	2021	2022	2023	2024	2025	2026	2027
Nominal gross public debt	44.2	48.7	58.9	61.9	62.9	63.0	63.4	63.9	64.3	64.8
Of which: guarantees (uncalled) ^{3/}	0.3	3.8	3.3	2.3	2.0	1.8	1.5	1.4	1.4	1.5
Real GDP growth (in percent)	3.8	2.7	-9.0	4.2	3.7	3.4	3.7	3.8	3.8	3.8
Inflation (GDP deflator, in percent)	4.4	4.1	4.0	4.0	3.7	3.8	3.7	3.7	4.0	4.0
Nominal GDP growth (in percent)	8.3	6.9	-5.3	8.4	7.5	7.3	7.5	7.7	8.0	8.0
Effective interest rate (in percent) ^{4/}	5.8	6.2	6.3	6.2	5.8	5.9	6.2	6.4	6.4	6.5

Because of its simplicity the Public Debt Dynamics Tool (DDT) has proven useful for **sustainable capacity development**:

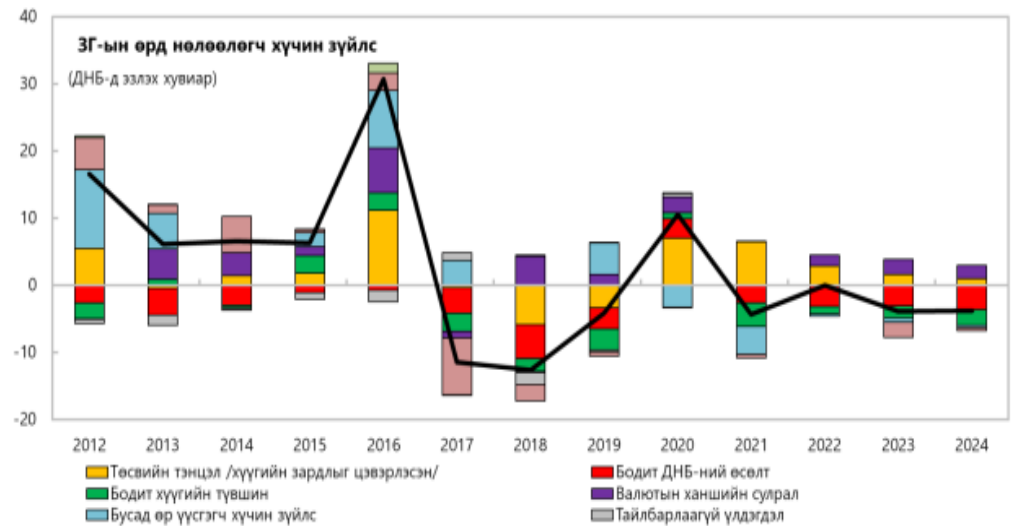
Very busy government officials can run the DDT on their own, even after frequent staff turnover.

The DDT is already being used in several countries to improve **polycymaking including internal discussions, debt reports, and communication with IMF staff.**

Өрийн тогтвортой байдлын шинжилгээ

Өрийн тогтвортой байдлын шинжилгээнд аливаа улсын Засгийн газрын өр, ДНБ-ний харьцаа 50 хувиас давсан тохиолдолд тухайн улсыг “Сайтар шинжлэх” шаардлагатай орны ангилалд багтаан илүү нарийвчилсан шинжилгээг хийдэг. Монгол Улсын Засгийн газрын нэрлэсэн өрийн үлдэгдлийн ДНБ-д эзлэх харьцаа 2020 онд 75.5 хувь байгаа ба 2023 он хүртэл Засгийн газрын өрийн баталгаа гаргаагүй тохиолдолд тус харьцаа 70 хувиас их байхаар төсөөлөгдөж байгаа тул “Сайтар шинжлэх” шаардлагатай орны ангилалд орж байна.

Сүүлийн 10-н жил болон ирэх 3-н жилийн Засгийн газрын өр, ДНБ-ний харьцаа хэрхэн өсөж, буурахаар байгааг Графикт харууллаа. Засгийн газрын өрийн хэмжээ 2012-2016 онд ихээхэн хэмжээгээр өссөн байна. Үүнд Засгийн газар баталгаа гаргаж эхэлсэн, төсөв алдагдалтай батлагдсан, валютын ханш суларч байсан зэрэг үзүүлэлтүүд ихээхэн нөлөө үзүүлжээ. Харин Засгийн газрын өр, ДНБ-ний харьцаа 2017-2019 онуудад буурсан нь ДНБ-ний өсөлт болон бодит хүүгийн түвшний бууралт зэргээс хамаарсан байна. Цаашид ч бодит ДНБ-ний өсөлтийг дэмжиж, төсвийн үндсэн тэнцлийг бууруулах нь өрийн тогтвортой байдлыг хангах суурь үндэс болохоор байна. 2022-2023 онуудын хувьд валютын ханш 2.8 болон 4.1 хувиар суларч, төсвийн үндсэн тэнцэл алдагдалтай байхаар төсөөлөгдсөн ба тус онуудад бодит ДНБ-ний өсөлт өндөр байхаар төсөөлөгдөж байгаа нь өрийн ДНБ-д эзлэх харьцааг бууруулах гол хүчин зүйл болохоор байна.



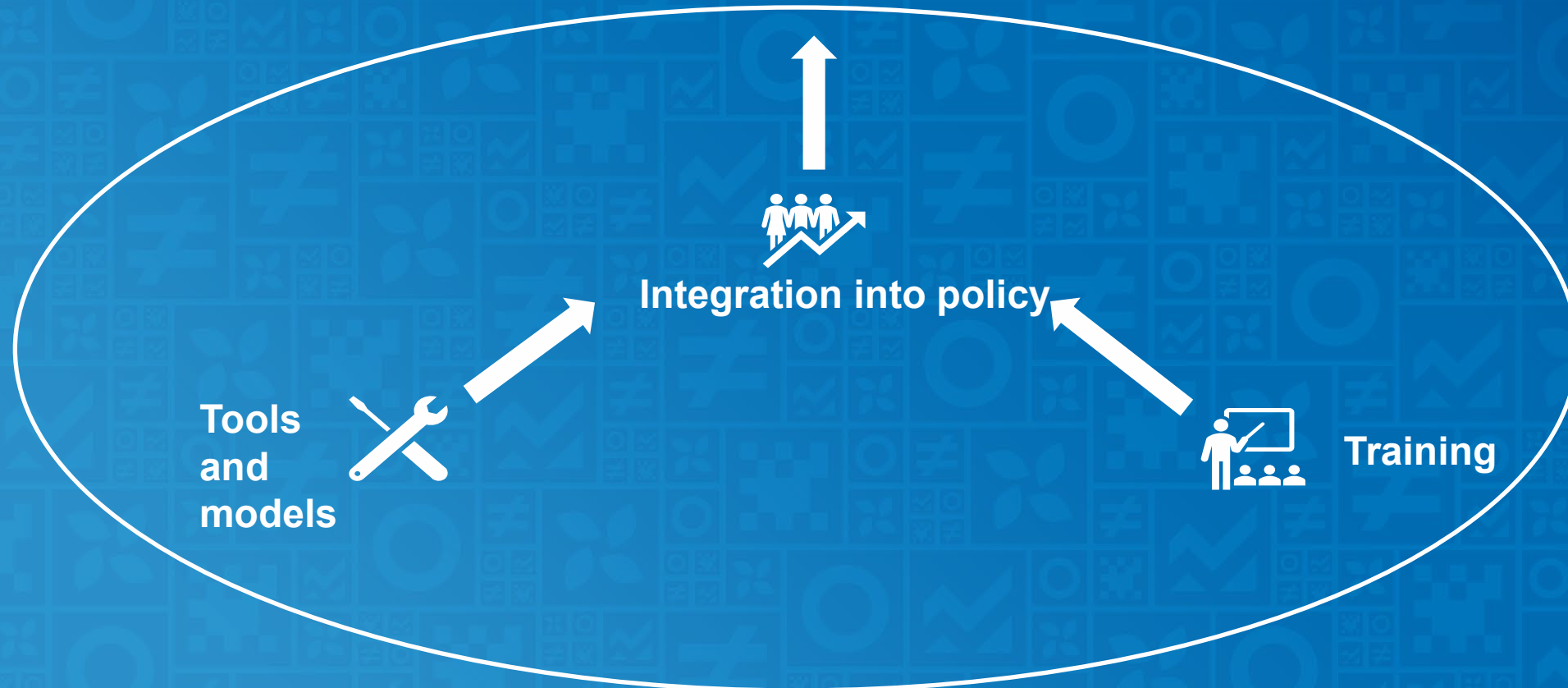


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How do we use the **Public Debt Dynamics Tool (DDT)** for **Capacity Development**?



The Public Debt Dynamics Tool (DDT) is one of the tools developed by the IMF Institute of Capacity Development for its **new Macro Framework Technical Assistance Practice** focused on **macroeconomic forecasting and policy analysis for policy decision-making and communication.**



Because of the Public Debt Dynamics Tool (DDT) simplicity, DDT Technical Assistance has achieved results **very quickly**

after short virtual meetings (e.g., one hour per week for a couple of months)

and/or short face-to-face missions (e.g., one week or less),

often following DDT Training

Table 1: Results of the sensitivity analysis
Gross debt levels in % of GDP, by confidence interval

	2022	2023	2024	2025	2026
PERCENTILE 10-25	54.3	52.6	51.3	51.1	50.5
<i>PERCENTILE 25-50</i>	55.5	54.8	54.2	53.8	53.9
BASELINE SCENARIO	57.6	57.6	57.7	57.8	57.8
PERCENTILE 50-75	60.1	61.0	61.4	62.3	62.7
<i>PERCENTILE 75-90</i>	62.4	63.6	65.0	66.5	67.8

The Public Debt Dynamics Tool (DDT) is also featured in the IMF training program,

in **DDT-focused workshops**,

and standard courses including the Fiscal Sustainability course.

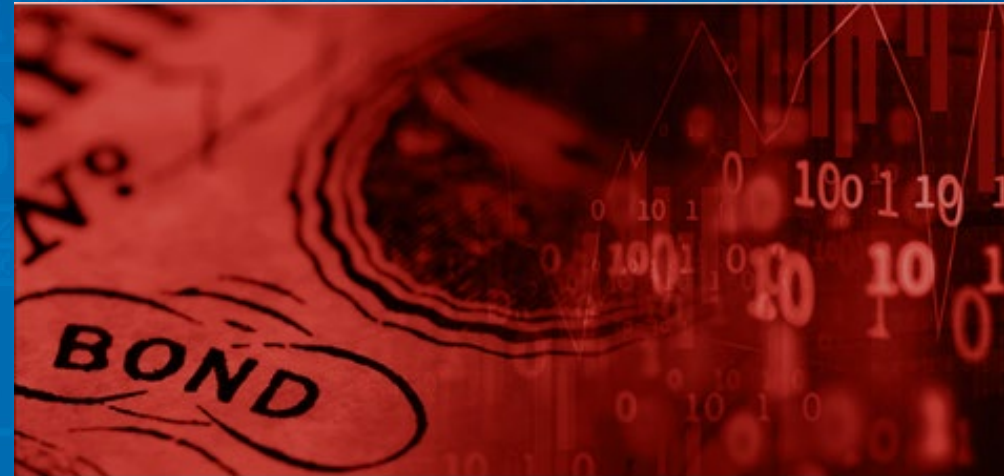
The online course DDTx:

- available in English and French (and soon in **Spanish**).

- **5 to 6 hours** to complete

- **1000 learners** have already worked with the DDTx.

Virtual, face-to-face, and blended training.



Online: Projecting Public Debt
- The Public Debt Dynamics
Tool (DDTx)

DDTx videos are also available on YouTube,

in the IMF Institute Learning Channel,

organized in three playlists:

1. Projecting public debt

2. Projecting public debt with the Public Debt Dynamics Tool (DDT)

3. Calculating possible fiscal adjustment paths with the Public Debt Dynamics Tool (DDT)

Projecting public debt

IMF Institute Learning Channel

8 videos No views Updated today



Play all

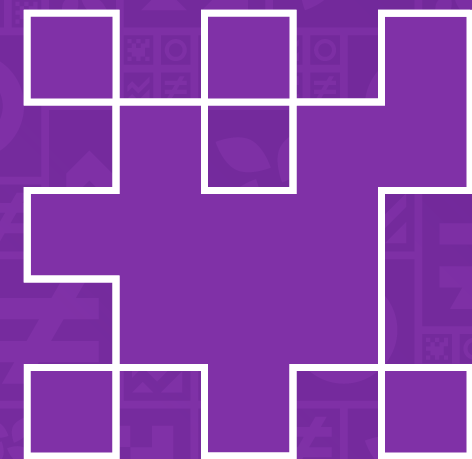


Shuffle

In this playlist, you will learn how to project the evolution of public debt (i.e., government debt) over time, for a given set of projections of the relevant macro-fiscal variables. The playlist covers simple calculations you can use to project the public debt level for the following year. The videos present these calculations with simple numerical examples for a hypothetical country. This document <https://courses.edx.org/assets/courseware/v1/v1:IMFx+DDTx+2T2022+type@asset+block/Mo> presents the equations used in the playlist. Additional information can be found in the online course DDTx <https://bit.ly/DDTxcourse>



Overview of the Public Debt Dynamics Tool (DDT)



The DDT's Debt Dynamics Equation

- The debt-to-GDP ratio evolves according to:

$$d_t = \frac{1 + \hat{r}_t^w}{1 + g_t} d_{t-1} - \mu_t p b_t + \mu_t o f_t \quad (1)$$

- $1 + \hat{r}_t^w = \frac{\alpha_{t-1}(1 + i_t^f e_t^{avg} / e_t^{eop})(1 + \varepsilon_t^{eop}) + (1 - \alpha_{t-1})(1 + i_t^d)}{1 + \pi_t} \mu_t$: cost of debt.
- $g_t, \pi_t, \varepsilon_t^{eop}, i_t, e_t^{avg}, e_t^{eop}, \alpha_t$: real GDP growth, inflation, exchange rate depreciation, effective interest rate, average and end-of-period exchange rates, share of foreign currency debt
- $\mu_t = (1 - \alpha_t(1 - e_t^{avg} / e_t^{eop}))^{-1}$: coefficient of stock-flow adjustment due to intra-year exchange rate fluctuations.

Color rules in the Public Debt Dynamics Tool (DDT)

- Information and relevant data should only be entered in **yellow-shaded** cells, which are in worksheets with **yellow** tabs.
- Light yellow-shaded** cells are used to indicate that the user can select the input from a drop-down menu.
- White cells contain formulas that users should not override.

Basic Inputs	
Select country	Macondo
First year of projection	2021
Year for medium-term indicators	2026
Definition of the public sector	central government
Includes public guarantees?	Yes
Specify or define the guarantees	outstanding amount of loans guaranteed by the central government

Baseline scenario

Macondo Public Sector Debt Dynamics - Baseline Scenario

(in percent of GDP unless otherwise indicated)

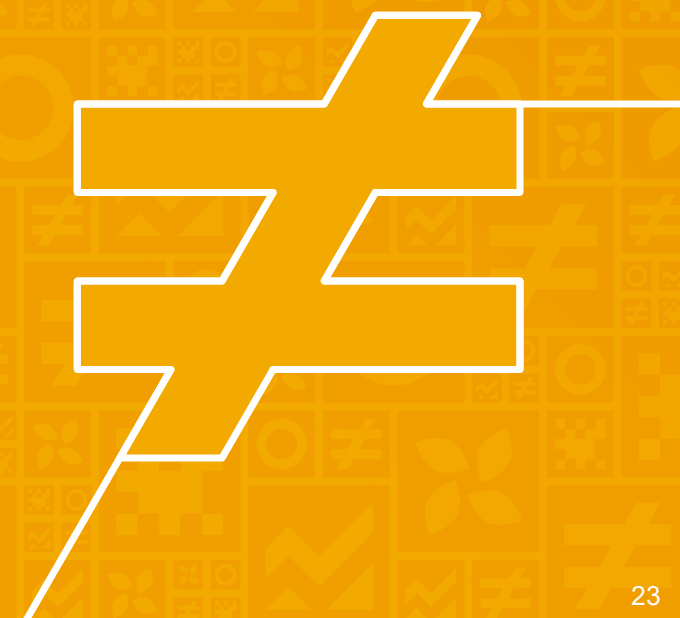
Debt and Economic Indicators ^{1/}

	Actual		Est.	Projections											
	2012-2018 ^{2/}	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Nominal gross public debt	44.2	48.7	58.9	61.9	62.9	63.0	63.4	63.9	64.3	64.8	65.0	65.4	65.9	66.2	66.6
Of which: guarantees (uncalled) ^{3/}	0.3	3.8	3.3	2.3	2.0	1.8	1.5	1.4	1.4	1.5	1.4	1.4	1.5	1.4	1.4
Real GDP growth (in percent)	3.8	2.7	-9.0	4.2	3.7	3.4	3.7	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Inflation (GDP deflator, in percent)	4.4	4.1	4.0	4.0	3.7	3.8	3.7	3.7	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Nominal GDP growth (in percent)	8.3	6.9	-5.3	8.4	7.5	7.3	7.5	7.7	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Effective interest rate (in percent) ^{4/}	5.8	6.2	6.3	6.2	5.8	5.9	6.2	6.4	6.4	6.5	6.2	6.4	6.5	6.2	6.4

- Let's watch a [video](#) describing the main contributors to debt changes in the baseline scenario.



Alternative scenarios in the Public Debt Dynamics Tool (DDT)



Historical scenario: Key debt drivers take **average historical values** and thus, this scenario triggers discussions about the **differences between baseline assumptions and historical values.**

Historical averages



Historical Scenario						
Real GDP growth	4.2	2.4	2.4	2.4	2.4	2.4
Inflation	4.0	4.4	4.4	4.4	4.4	4.4
Primary balance	-4.0	-1.7	-1.7	-1.7	-1.7	-1.7
Effective interest rate	6.2	5.8	5.8	6.0	6.2	6.2

Constant-primary-balance scenario: The **primary fiscal balance** takes the value of the first projection year and thus, this scenario shows the importance of the fiscal consolidation in the baseline.

Constant primary balance



Constant Primary Balance Scenario						
Real GDP growth	4.2	3.7	3.4	3.7	3.8	3.8
Inflation	4.0	3.7	3.8	3.7	3.7	4.0
Primary balance	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Effective interest rate	6.2	5.8	5.9	6.2	6.4	6.4

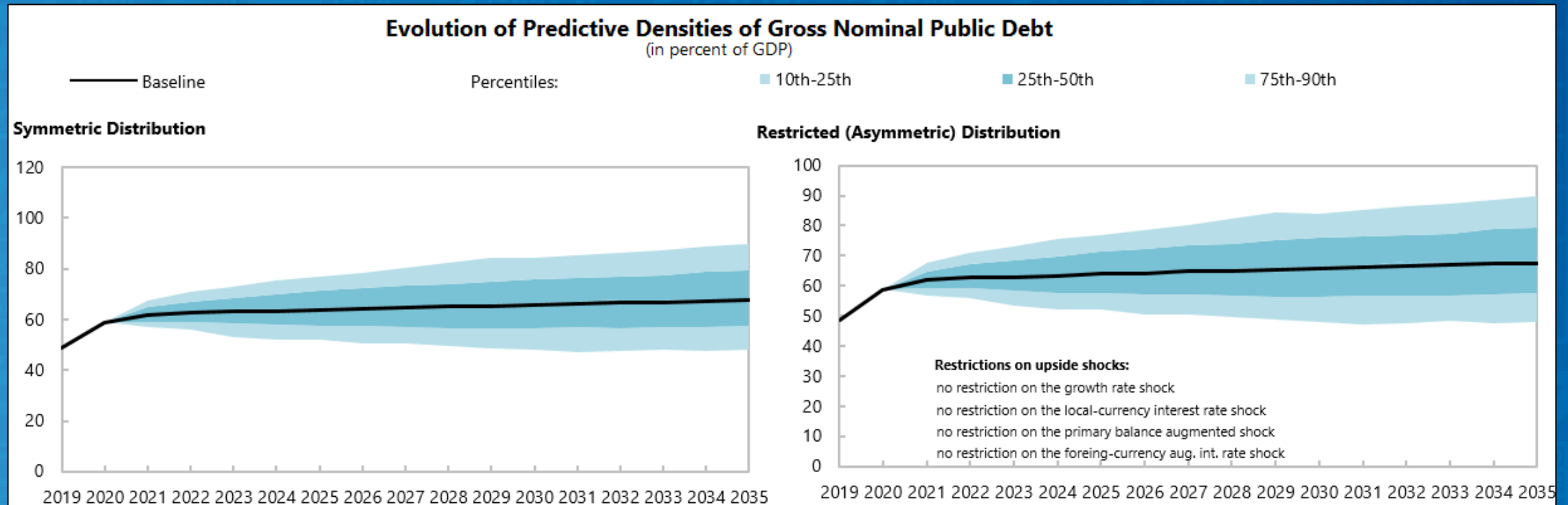
Shock scenarios: The Public Debt Dynamics Tool (DDT) also presents scenarios with a shock to each key debt driver (primary balance, growth, interest rates, depreciation rates).

Stress Tests Inputs	
Stress testing scenario design: size of shocks	Shock Size (number of historical standard deviations)
Primary balance shock	-1
GDP growth shock	-1
Interest rate shock	1
Exchange rate depreciation shock	1
Stress testing scenario design: duration of shocks	
Primary balance shock starts	2022
Primary balance shock ends	2023
GDP growth shock starts	2022
GDP growth shock ends	2023
Interest rate shock starts	2022
Interest rate shock ends	2023
Exchange rate depreciation shock starts	2022
Exchange rate depreciation shock ends	2023

We are working on a new template, the **ND_DDT**, that computes the effect of past **natural disasters** in all DDT macrofiscal variables, facilitating the construction of natural disasters scenarios.

Select event	148	Country name	Honduras
Pre-shock value	Average	Disaster Type	Storm
Number of years for average	1	Year	1998
Post-shock value	WEO Oct 2022		
Number of years	3		
First year of the shock	2023		
File name	DDT_Honduras_LEO		
	Import baseline	*Importing a baseline requires having the selected DDT file closed	
	Export scenario		

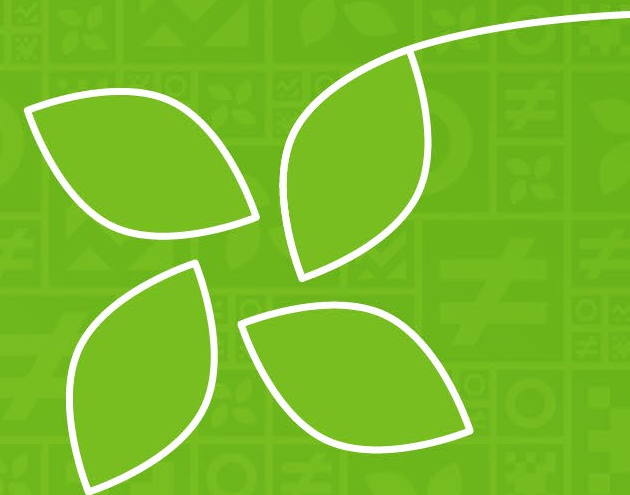
The DDT also produces **debt fan charts**, discussed in [this video](#).





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Fiscal consolidation scenarios



Fiscal consolidation inputs in **Readme**

Adjustment Paths Inputs

Debt target and adjustment period

To be completed after "Input - Data" is populated

Public debt-to-GDP target (e.g., for 60 percent of GDP, write 60)

60.0

Adjustment path starts

2025

Adjustment path ends

2035

Additions to Baseline Assumptions for Fiscal Adjustment Paths (for time-varying values)

2020 2021 2022 2023 2024

α_t : share of foreign currency denominated debt in total debt, percent of total debt (excl. guarantees)

e_t : nominal average exchange rate, local currency per unit of foreign currency

e_t : nominal end-of-period exchange rate, local currency per unit of foreign currency

i_t^d : nominal effective interest rate on local currency denominated debt, percent

i_t^f : nominal effective interest rate on foreign currency denominated debt, percent

π_t : GDP deflator inflation, percent

g_t : real GDP growth, percent

of_t : other net-debt creating flows, percent of GDP



With these inputs, the Public Debt Dynamics Tool (DDT) computes automatically different **fiscal adjustment scenarios**

level and yearly change of the primary balance that yield a 60% debt ratio in 2035 7/	
1.0	0.1

- Let's watch a [video](#) describing one of the fiscal adjustment scenarios.



Conclusions



In sum

- The Public Debt Dynamics Tool (DDT) is tailored for **do-it-yourself capacity development**
- The DDT's **simplicity** allows for the **sustainable** transmission of knowledge to a **variety of counterparts**
- Many countries are using the DDT, including for **public debt reports**
- We are always happy to talk (and even more so about the DDT!):
 - Marie Pierre Aquino Coste: maquinocoste@imf.org
 - Leonardo Martinez: lmartinez4@imf.org
- **Questions?**

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