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Macroframework Foundations Tool (MFT) 1.0: User Manual

Tubagus Feridhanusetyawan, Amgad Hegazy, Marie-Pierre Aquino Coste, Michal Andrle, Robert Corker, and Fernando Delgado

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Contents

Abbreviations

BOP	balance of payments
CAEM	Comprehensive Adaptive Expectations Model
CD	capacity development
CPI	Consumer Price Index
DDT	Public Debt Dynamics Tool
DSGE	Dynamic Stochastic General Equilibrium
FDI	foreign direct investment
FPP	Financial Programming and Policies
ICD	Institute for Capacity Development
ICDMF	Institute for Capacity Development General Macro and Fiscal Division
IMF	International Monetary Fund
MFT	Macroframework Foundations Tool
POET	Potential Output Estimation Tool
QMFF	Quarterly Macro Forecasting Framework
SEI	selected economic indicator
SMT	Standard Macroframework Template
STAMP	Structural Analysis of Macroeconomic Policies
TA	technical assistance
WEO	World Economic Outlook

I. Executive Summary

This User Manual discusses the operational aspects of the Macroframework Foundations Tool (MFT) developed by the Institute for Capacity Development General Macro and Fiscal Division (ICDMF) of the International Monetary Fund (IMF). The MFT is a macroeconomic projection tool based on a multi-sector macroeconomic framework that can be used for forecasting and policy analysis. MFT 1.0 is the basic version of the MFT while the tool is being further developed to incorporate more features. The structure of the MFT is based on the standard four-sector (real, external, fiscal, and monetary) framework of the Financial Programming and Policies (FPP) developed and used by IMF staff, but it is simplified by adopting greater sectoral aggregation and requiring less data. Different from the standard accounting-based FPP framework, the MFT relies on behavioral equations for generating projections and incorporates explicit feedback loops between variables across sectors.

The MFT's key design features are its simplicity, consistency, and flexibility. The MFT is designed to be a simple but rich framework for producing macroeconomic projections based on country data, behavioral equations, intersectoral accounting relationships and identities, exogenous variables, and policy assumptions while integrating users' expertise and judgment in guiding forecast outcomes.

- **The MFT adopts a simple structure with minimal data requirements, making it easy to build and operate for producing macroeconomic projections.** It employs an intuitive Excel template that has six worksheets and requires minimal input data of about 60 variables that cover country-specific and external environment data. Users can follow simple steps from collecting input data to calibrating the framework, specifying policy and exogenous variables, and generating projections. Building and operating the MFT require basic skills in macroeconomics, familiarity with the multisector macroeconomic framework, and the ability to perform simple Excel operations.
- **Despite its simplicity, the MFT is a powerful tool for producing consistent macroeconomic projections.** The projections are consistent from accounting and economic perspectives because all macroeconomic sectors are interlinked to satisfy macroeconomic identities and the relationships among variables are based on sound economic principles expressed in behavioral equations. Solving these equations simultaneously will produce equilibrium values of GDP and inflation that feed back to the economy and generate projections for macroeconomic variables in all sectors. The projection's convergence to a steady-state equilibrium depends on the specification of the equations and the assumptions on policies and exogenous variables.
- **The MFT provides flexibility for users and policymakers to customize the framework and accommodate different objectives and country-specific needs.** It could be extended to incorporate a longer projection horizon, greater sectoral details, and a different policy environment. The coverage of sectoral details could be expanded to enable specific policy analysis or present detailed projections. For example, the standard MFT is designed for a pegged exchange rate regime, but the framework could be modified to endogenize the exchange rate to reflect a floating exchange rate regime. Note that expanding the MFT to cover greater details or adding endogeneity would increase the data requirements and the complexity of the framework.

Given these features, the MFT is useful for countries or users who want to develop a simple yet powerful macroeconomic projection tool for policy analysis. The simplicity and flexibility of the MFT are useful for the IMF's work in capacity development, which is the main purpose for developing the MFT. In training, the MFT has been used in macroeconomic courses such as the FPP over the past five years. In technical assistance (TA), the MFT's simple and flexible features have been useful for tailoring the tool

to meet country-specific needs and adapt to capacity (institutional, staffing, or statistical) constraints. As of March 2025, the MFT has been used in ICD's TA in 14 countries in Africa, Asia, the Middle East, and the Western Hemisphere. The MFT could be used for policy analysis by comparing the projections of the baseline with those of alternative scenarios by changing assumptions on policy and exogenous variables. The MFT is particularly useful in countries where the availability of macroeconomic data remains a constraint. Even when data availability is not an issue, users could use the MFT to build a simple yet powerful tool for macroeconomic analysis and forecasting. Given the MFT's ease of use and maintenance, IMF desk economists could also use it for policy analysis to complement their main macroeconomic framework. It is worth noting, however, that using a simple framework may require more expert judgments in making projections.

Within the array of projection tools developed by the ICDMF, the MFT is the simplest version of semi-structural models because of its simple structure and data requirements. Compared with the traditional FPP framework, the MFT employs a set of behavioral equations that allow GDP components and inflation to be projected simultaneously, capturing general equilibrium interactions across sectors. It represents the simplest macroeconomic framework covering four sectors while incorporating endogenous output and inflation. For low-capacity countries that want to better understand key macroeconomic linkages and conduct policy scenario analysis, the MFT offers a simpler alternative than the traditional FPP framework. For those who focus more on long-term projections and steady-state properties, and where data availability is not a constraint, other tools could be an option.

This User Manual and the accompanying MFT 1.0 Excel template are intended to provide practical guidance to build and operate the MFT. The MFT is not a ready-to-use tool because it needs to be built and customized to a specific country, and this Manual could guide that process. The Excel template has been populated with data from a hypothetical country, "Macrofoundland," to provide examples of MFT operations, from collecting input data and customizing the framework to generating projections. The template could also be used by MFT users to start building a macroeconomic projection tool in a real country. The ICDMF staff would stand ready to support MFT users in building, customizing, and operating the MFT.

This User Manual is organized as follows. Chapter II introduces the MFT, including its key features and uses in capacity development. Chapter III describes the structure and design of the MFT, from the macroeconomic framework and behavioral equations to operational workflow using Excel. Chapter IV elaborates the step-by-step process for building and operating the MFT. Finally, Chapter V provides examples of customizing the MFT to address country-specific needs. Annex 1 presents the macroeconomic identities and derivation of equations, and Annex 2 provides examples of MFT extensions to incorporate greater disaggregation of the fiscal and real sectors.

II. Introduction

A. The Macroframework Foundations Tool (MFT) as a Macroeconomic Projection Tool

The MFT is a macroeconomic projection tool based on an integrated macroeconomic framework that can be used for forecasting and policy analysis. The structure of the MFT is based on the IMF's standard Financial Programming and Policies (FPP) framework that incorporates time series from all sectors and maintains essential links between variables based on accounting identities to ensure consistent projections (see https://www.imf.org/en/Capacity-Development/Training/ICDTC/Courses/FPP). The MFT retains the original four-sector (real, external, fiscal, and monetary) structure of the FPP, but it is simplified by adopting a greater sectoral aggregation and less data, while users have the flexibility to modify the framework and extend the coverage. In addition, the MFT generates macroeconomic projections by using behavioral equations based on economic theory and incorporating explicit feedback loops between variables across sectors. MFT 1.0 is the basic version of the MFT while the tool is being further developed by expanding the framework and incorporating more features for policy analysis.

The MFT uses a simple Excel template to produce macroeconomic projections based on country data, behavioral equations, and assumptions on policy and exogenous variables. The standard template has six worksheets and requires minimal input data of about 60 variables that comprise country and external environment indicators. Because the MFT is not a ready-to-use tool, users must build the MFT template and customize it to a specific country before generating projections. After collecting input data, users should customize the behavioral equations, make assumptions on policy and exogenous variables, and solve the framework to generate projections. Once the baseline projection is completed, users can build alternative scenarios under different policies and assumptions and then generate alternative projections for comparison. Like other macroeconomic projection tools that rely on expert insights, the MFT helps users incorporate their judgments in an internally consistent and flexible way.

Despite its simple structure, the MFT is a powerful tool for producing macroeconomic projections that are consistent based on macroeconomic accounting identities and economic theory. From an accounting perspective, the projections are consistent because all macroeconomic sectors are interlinked to satisfy macroeconomic identities based on economic theory and the FPP framework. From an economic perspective, the projections are also consistent because the relationships among variables are based on sound economic principles expressed in a system of behavioral equations. The MFT relies on behavioral equations to produce projections for GDP components and inflation, which in turn feed back to the economy through the linkages between variables across sectors. Solving these equations simultaneously will produce equilibrium values of GDP and inflation as a function of exogenous variables and policy assumptions that satisfy internal macroeconomic consistency. Whether the projection will converge to a steady state over the long term depends on the specification of the equations as well as on the paths of presumed policies and exogenous variables during the projection period.

The MFT could be extended to incorporate a longer projection horizon, greater sectoral details, and different policy environments while keeping the principles of simplicity and flexibility. Users could modify the MFT to extend the projection horizon, for example, by adding error correction terms to the MFT equations and formulating assumptions on policy and exogenous variables to help expedite convergence to a steady-state equilibrium. Depending on data availability, the coverage of sectoral details could be expanded to enable specific policy analysis or present detailed projections. The standard MFT framework is suitable for a pegged exchange rate regime because the exchange rate and interest rate are set exogenously based on policies. On the fiscal side, government expenditures and tax policy parameters are also exogenous, depending on policies. In this context, the MFT is useful for policy simulation because

users could specify policy variables, such as interest rate, exchange rate, and government spending, and analyze their impacts on macroeconomic projections. The MFT framework could also be modified by endogenizing these policy variables, for example, to reflect a flexible exchange rate regime or country-specific needs and circumstances. However, expanding the framework to cover greater sectoral details or adding endogeneity will raise the number of input data variables and increase the complexity of the framework, particularly in specifying the relationships among endogenous and exogenous variables. The system of equations will become more complex and may require multiple iterations to find a solution. There is a trade-off between simplicity and theoretical rigor in developing macroeconomic projection tools, and the MFT strikes a balance by leaning towards simplicity.

The MFT is developed by the ICDMF for capacity development activities. The macroeconomic projection tools developed by the ICDMF include the following:

- Accounting-based Tool: Standard Macroframework Template (SMT)
- Semi-structural Adaptive Expectation Models: MFT, Comprehensive Adaptive Expectations Model (CAEM)
- Semi-structural Gap Model: Quarterly Macro Forecasting Framework (QMFF)
- Structural Dynamic Stochastic General Equilibrium (DSGE) Model: Structural Analysis of Macroeconomic Policies (STAMP)

There are also other supplementary tools for specific purposes, such as the Public Debt Dynamics Tool (DDT) and the Potential Output Estimation Tool (POET).

Within this array of models and tools, the MFT is positioned as the simplest version of semi structural models because of its structure and minimal data requirements. The choice of the tool for capacity development depends on various considerations, including the initial skill capacity, data availability, country characteristics, and the authorities' specific needs, such as projection horizon, sectoral coverage, aggregation level, and policy focus. Compared with the traditional FPP framework, the MFT employs a set of behavioral equations that allow GDP components and inflation to be projected simultaneously, capturing general equilibrium interactions across sectors. It represents the simplest macroeconomic framework covering four macroeconomic sectors while incorporating endogenous output and inflation. For low-capacity countries that want to better understand key macroeconomic linkages and conduct policy scenario analysis, the MFT offers a simpler and more user-friendly alternative than the traditional FPP framework. Although extending the MFT is possible for incorporating specific needs, users should also explore whether using other more appropriate tools could be a better solution. For example, for those who would like to focus more on long-term projections and steady-state properties, and where data availability is not a constraint, other tools such as the CAEM could be an option.

Against this background, it is worth noting that using a simple framework may require more expert judgment in making projections. For example, the simple formulation of MFT's behavioral equations may require additional assumptions on policies and exogenous variables to ensure that the projections would converge to a steady-state equilibrium over the long term. Greater sectoral aggregation would require less input data, but users may need to make specific assumptions or develop a satellite tool to analyze the detailed impact of specific policies and incorporate the results into the MFT. Expert judgments would also be needed in customizing the MFT to accommodate specific policy environments (for example, specific tax policies or exchange rate regimes), particularly in deciding whether switching to another tool is more appropriate than modifying the MFT. In this context, having a wide range of models and tools available for capacity development is important to meet the country's specific needs.

This User Manual and the accompanying Excel template are intended to provide practical guidance for users to build and operate the MFT. The Manual and the template present the standard version of the

MFT to help users learn and build the MFT from the beginning. After they become more familiar with the standard MFT, they could modify or extend it to address specific needs, for example, by disaggregating certain sectors or incorporating specific policies. The MFT standard template has been populated with input data from a hypothetical country, "Macrofoundland," to provide examples of MFT operations, from collecting input data and customizing the MFT to generating projections. Users could also use the standard template to start developing the MFT as a macroeconomic projection tool in a real country. However, the template is not ready for use straight after the "Macrofoundland" data are replaced with data from a real country because the template should be built and customized first. In this context, the Manual focuses on presenting guidance for building the MFT rather than providing specific instructions to operate the Excel file. The ICDMF stands ready to assist MFT users in developing and customizing the MFT to meet their needs.

B. Intended Use in Capacity Development

The MFT's simplicity and flexibility are useful for training in macroeconomic courses and providing technical assistance (TA) in countries or institutions with limited capacity and resources.

- **In training**, the MFT has been used in several FPP courses. The early version of the MFT, or the "barebones" model, was used in the FPP courses during 2020–21. It was delivered virtually to country officials and experts and offered as a short primer on the practical aspects of macroeconomics to a nonexpert audience. The simple framework was useful for analyzing key economic concepts, sectoral linkages, and policy implications, providing insights on how this framework could be further developed and used for TA activities and real policy analysis. Recently, the MFT was used in an in-person training course delivered to the staff of the European Commission of the European Union.
- **In TA**, the MFT's easy-to-use features have been useful for tailoring the tool to meet country-specific needs and adapting it to capacity (institutional, staffing, or statistical) constraints. Developing MFT requires minimal preparation in terms of institutional setup and technical infrastructure (software, data, and so on). The MFT could also be shared across institutions because of its portability, facilitating collaboration and policy dialogue across different institutions entrusted with policymaking. The output can be easily integrated into the official decision-making processes and relevant policy documents to improve the quality and implementation of macroeconomic policies.

As of March 2025, the MFT has been used in ICD's TAs in 14 countries. These countries are Bangladesh, Barbados, Central African Republic, Chad, Curacao, El Salvador, Iraq, Jamaica, Lao PDR, Liberia, Mauritania, Sri Lanka, St. Marteen, and Vietnam. These TAs have supported various institutions, including the Ministry of Finance, Central Banks, Ministry of Economy, Ministry of Planning and Investment, government research institutes, and others.

In most TA practices, the authorities established a dedicated country team with clear roles and responsibilities to build and operate the MFT. Depending on the country's institutional setup, the team could be small with five members or large with more than 20 members across different institutions. In all cases, effective coordination between the analytical team and policymakers is essential to incorporate the projection results into the policymaking process, which in turn also helps build ownership and strengthen TA implementation.

Building and operating the MFT would require basic skills in macroeconomics and Excel operations. Familiarity with the multisector macroeconomic framework and transmissions between variables across sectors would be useful for understanding the structure and design of the MFT. The capacity to translate macroeconomic policies envisaged by policymakers into a specific format to be analyzed by the MFT is also important. The country team usually comprises senior staff responsible for formulating policy scenarios and presenting projection results and junior staff responsible for building the MFT and operating the Excel file.

All team members are encouraged to take macroeconomic training provided by the IMF (https://www.imf.org/en/Capacity-Development/Training/ICDTC).

Documenting the development of the MFT as an analytical tool is also critical to sustain capacity development. Countries with limited capacity and resources often face institutional challenges such as limited coordination across institutions and high staff turnovers. It is recommended that the country team produces guidance to operate the MFT that has been built and customized to help new staff learn the tool and mitigate the risk of staff turnovers. Complete documentation would also promote transparency and facilitate discussion and sharing of the tool across various institutions in the country.

III. MFT Structure and Design

This chapter presents the structure and design of the MFT's macroeconomic framework, behavioral equations, and Excel template. Because the MFT needs to be built and customized, understanding its standard structure and design will help users build the MFT and make it operational in the Excel template.

A. MFT Structure

The structure of the MFT is based on the standard four-sector macroeconomic framework with feedback loops among variables across sectors. The MFT is a macroeconomic projection framework that produces forecasts based on accounting consistency and economic models or behavioral equations that reflect relationships among variables. It is designed to be a simple but rich framework for producing a macroeconomic projection using country data, behavioral equations, exogenous variables, policy assumptions, intersectoral consistency, and standard macroeconomic identities. Because the MFT is based on the FPP framework, the projections are consistent from an accounting perspective as all four sectors (real, external, fiscal, and monetary) are interlinked to satisfy macroeconomic identities. The projections are also consistent from an economic perspective because they are based on sound economic principles expressed in a system of behavioral equations. The MFT generates short- to medium-term projections based on MFT equations, policy assumptions, and exogenous variables that include country data and external environment. The MFT forces users to consider their GDP projection from an expenditure perspective and its linkages to fiscal and monetary policy variables. Whether the projection will converge to a steady state over the long term depends on the specification of the equations as well as the presumed policies and exogenous variables.

Bearing in mind the accounting and economic perspectives, the basic structure of the MFT is based on the original "barebones" model that comprises three main blocks (Figure 1):

- Behavioral equations drive projections for real GDP components by expenditure and inflation (**1. GDP & Prices**).
- The nominal values of macroeconomic variables form the savings-investment (S-I) identity and define sectoral balances including the financing needs (**2. Deficits & Financing**).
- Fiscal and monetary policies generate projections for fiscal and monetary variables that are needed to finance the S-I gaps and close the macroeconomic framework (**3. Policies**).

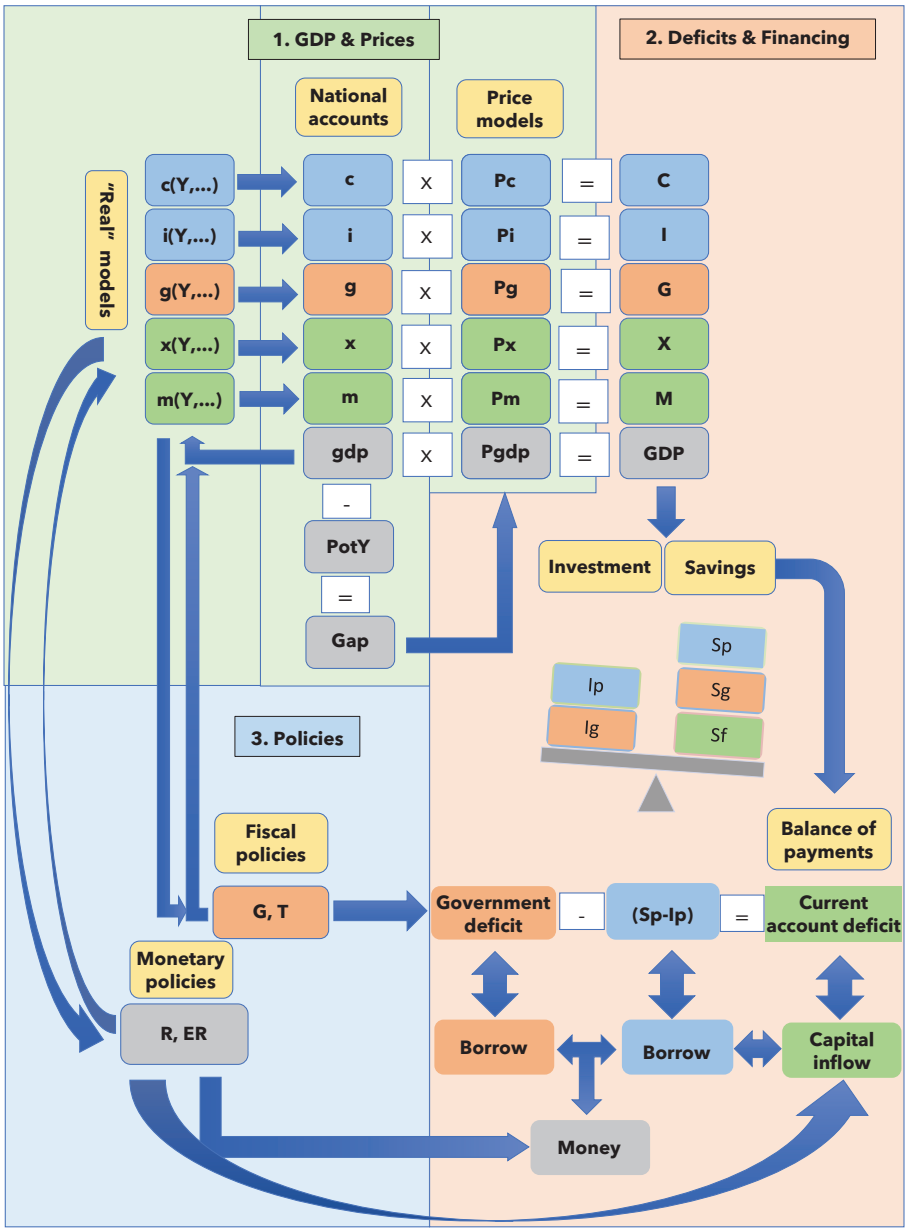
The dynamic interlinkages in the MFT's design and structure for generating macroeconomic projections are as follows:

- Real private consumption, private investment, exports, and imports in GDP are projected based on behavioral equations, whereas real government consumption and investment are projected based on government expenditures in the fiscal sector.
- Potential GDP is projected exogenously, and the comparison between potential and real GDP determines the output gap.
- Inflation is projected using a behavioral equation following a short-term Phillips Curve type. GDP deflators are projected based on inflation and prices of exports and imports as well as the exchange rate. Price deflators are combined with real GDP to project nominal GDP.
- Exports and imports from the nominal GDP feed into the trade balance in the balance of payments (BOP), and combined with exogenously projected primary and secondary incomes, produce the projections for the current account balance or the S-I balance of the economy. The primary and

secondary incomes and the GDP also produce the Gross National Disposable Income (GNDI), which is used to project private consumption.

- The S-I balance is split into two main drivers: Public S-I balance that reflects the fiscal balance and the Private S-I balance as a residual. The sources of financing of the S-I gaps come from the external, fiscal, and monetary sectors. Fiscal and monetary policies generate projections for fiscal and monetary variables to finance the S-I gaps and close the macroeconomic framework. The financing of S-I balances is presented in Figure 2, while the macroeconomic identities that ensure the consistency of the macroeconomic framework are presented in Annex 1.

Figure 1. MFT: Macroeconomic Framework and Feedback Loops



Source: IMF staff.

Figure 2. MFT: Savings-Investment Balance and Financing

Current account balance	**=**	**External balance**
Financed by:		Source of data:
Government borrowing		Fiscal
Private capital flows		Balance of payment
Change in foreign exchange reserves		Balance of payment
=		-
Public net savings	**=**	**Fiscal balance**
Financed by:		Source of data:
External borrowing (net)		Fiscal
Bank credit (net)		Monetary/fiscal
Other		Residual
+		=
Private net savings	**=**	**External – Fiscal balance**
Financed by:		Source of data:
Bank credit		Monetary
Others		Residual

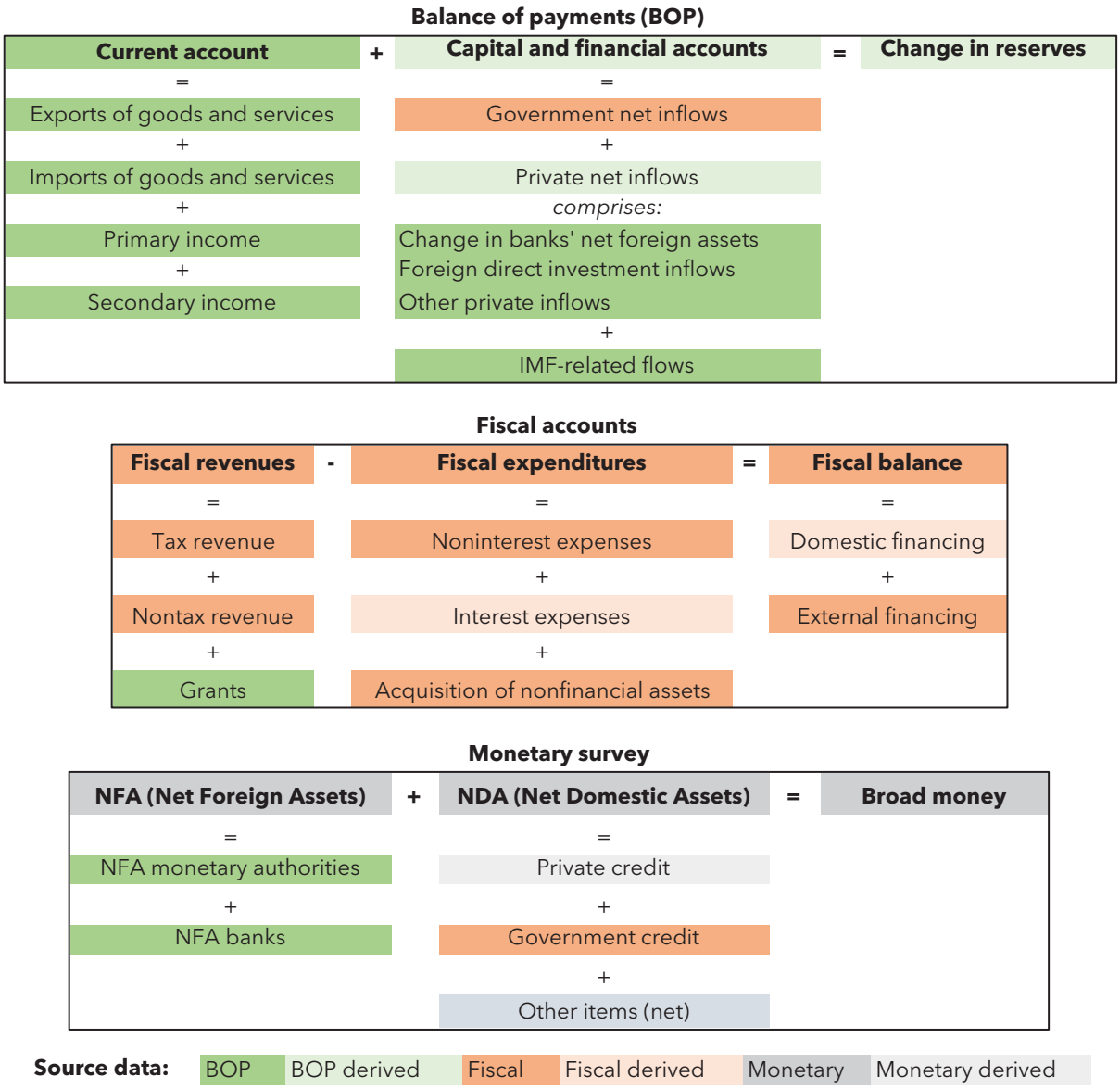
Source: IMF staff.

The MFT framework could be viewed from the perspectives of internal balance, external balance, and policies that drive macroeconomic adjustment and generate projection (see Berg and others 2023).

- **Internal balance:** Solving the MFT equations produces projections for GDP, GDP components, and inflation where the demand and supply are reconciled, although the economy may not be in a steady state. The MFT is intended to produce short- to medium-term projections, and understanding the position of the economy as compared with its potential or steady state would be useful for macroeconomic diagnostics and policy responses. Whether the output gap will close or remain open over time depends on the specification of MFT equations and the assumptions on policy and exogenous variables during the projection period (discussed in Section B).
- **External balance:** The current account balance is financed by the capital and financial flows of the private and public sectors as well as the changes in the international reserves. These factors depend on the changes in the external environment as well as domestic policies.
- **Policies:** Formulating fiscal and monetary policies to achieve certain objectives (for example, closing the output gap, stabilizing inflation, preserving international reserves, sustaining public debt, or other objectives) matters in financing the external balance, driving economic adjustments, and generating projections for the economy.

The dynamics in the external, fiscal, and monetary sectors depend on assumptions on policies and exogenous variables that play an important role in closing the framework and financing the external balance (Figure 3).

Figure 3. MFT: External, Fiscal, and Monetary Sectors



Source: IMF staff.

- **In the external sector**, the financing of the current account comes from private financial flows (for example, portfolio investment, direct investment, banks' flows), government flows (for example, external loans, grants), and the changes in international reserves. In the standard MFT template, exchange rate, interest rate, and private capital flows are exogenously determined by policies and assumptions, and therefore, any balance of payment adjustments in response to policy changes (such as exchange rate depreciation) would take place in the current account (derived from changes in exports and imports in the real sector) and the external financing of the government (derived from the fiscal sector). Users could modify the MFT equations by endogenizing the exchange rate, for example, as a function of domestic and foreign inflations, but this will require modifying the MFT structure (see Chapter V).
- **In the fiscal sector**, the projections for revenue and expenditure could be linked to GDP or projected exogenously based on policy assumptions. The financing of fiscal balance comprises domestic

financing (linked to the monetary sector) and external financing (linked to the external sector). The external fiscal financing is based on assumption, and the domestic financing is treated as residual.

- **In the monetary sector**, the net foreign assets are projected from the balance of payments, the net credit on government is projected from the fiscal sector (domestic fiscal financing), and the other items net of the net domestic assets is projected based on assumptions. This leaves two other components to be projected: broad money and credit to the private sector. In the standard MFT, broad money is projected using a money demand equation, leaving the projection for credit to the private sector as residual. However, users could modify the MFT by making projections for credit to the private sector and treating broad money as residual, although it is not common in the standard FPP. The monetary sector serves as an important checkpoint for the consistency of the macroframework.

The MFT could be used for policy analysis by comparing the projection results under the baseline scenario with that of alternative scenarios. By changing assumptions on policies and exogenous variables, MFT users could analyze their impact on the internal and external balances of the economy and formulate policy responses to correct any imbalances and help converge to a steady state.

In summary, understanding the basic properties of MFT structure is critical for generating projections and analyzing the results. Making sure all variables add up within and across sectors will ensure consistency from an accounting perspective. Analyzing the specification of MFT equations, particularly the nature of endogenous variables and how they are simultaneously determined, will help in setting up the framework for generating projections. Understanding the properties of the standard MFT, including its strengths and limitations, is important before modifying the framework. For example, MFT users may want to endogenize policy or exogenous variables, but this modification may add endogeneity that requires multiple iterations to find a solution. Therefore, such modification should be done carefully to preserve the simplicity of the framework and the consistency of the projection.

B. MFT Behavioral Equations

One of the important components of the MFT is the specification of behavioral equations to project the expenditure components of GDP and the evolution of inflation. These equations are the main driving forces of macroeconomic variables, which in turn feed back to the real economy and prices. The entire system is then solved iteratively to achieve internal macroeconomic consistency. The MFT equations are behavioral in nature because they try to relate how one macroeconomic variable responds or reacts to another variable in line with economic theory. As such, the MFT produces rich projections in terms of their economic intuition and intersectoral linkages that can provide a meaningful narrative, which is useful for policy analysis and decision making. The MFT uses five behavioral equations (private consumption, private investment, exports, imports, and inflation) to project real GDP components and inflation.

With its emphasis on simplicity, the MFT opts for a growth-rate specification of the behavioral relationships, allowing users to read coefficients as elasticities between variables. With an appropriate specification and assumptions on policy and exogenous variables during the projection period, all real variables would settle at a constant growth path over the medium to long term, consistent with the potential growth of the economy. If users plan to modify the standard MFT equations, they should be aware of the magnitude of the coefficients or elasticities in determining the short- and long-term relationships between variables. Users should also pay close attention to the convergence behavior of the real and nominal variables and the evolution of relative variables, such as in terms of shares of GDP. To impose expert judgments, each behavioral equation features a shock, also labeled as a residual, tune, or an add factor. These add factors are important components in forecasting to capture informed judgments on projections or specific shocks that cannot be captured by the behavioral equations. Annex 1 discusses the short- and

long-term properties of the MFT equations, including the trade-off between maintaining simplicity and anchoring to a long-term steady-state equilibrium.

The MFT behavioral equations are as follows:

Real private consumption:

$$\dot{c} = \alpha_1 \dot{c}_{-1} + \alpha_2 \dot{yd} - \alpha_3 (rr - rr_{-1}) + \varepsilon_t .$$

Private consumption ($\dot{c}$) growth depends on the lagged consumption growth, the growth of real private disposable income (real national income adjusted for taxes and transfers ($\dot{yd}$)), and the change in real interest rates (rr). If the coefficients α_1 and α_2 sum to unity, private consumption and income grow in line in the long term. This is a property users may wish to impose to converge to a stable consumption share of output in the long term.[1] The coefficient α_2 is an elasticity of consumption with respect to real disposable income. The coefficient on the real interest rate term is expected to be negative.

Real private investment:

$$\dot{i} = \beta_1 \dot{yp} + \beta_2 (\dot{y} - \dot{y}_{-1}) - \beta_3 (rr - rr_{-1}) + \varepsilon_t .$$

Private investment growth ($\dot{i}$) depends on the growth of potential output ($\dot{yp}$) and the *change* in GDP growth ($\dot{y}$), as well as the change in real interest rates (rr). To achieve a stable investment/GDP ratio in constant prices over time, the coefficient β_1 should be one. The change in GDP growth term acts as an "accelerator" as investment usually rises more quickly than GDP in an economic upswing and vice versa as economic growth softens. On average, however, the accelerator term will not affect the long-term ratio of investment to GDP.

Real exports:

$$\dot{x} = \gamma_1 \dot{yw} - \gamma_2 \dot{reer} + \varepsilon_t .$$

Export growth ($\dot{x}$) depends on market growth ($\dot{yw}$) and the change in the real effective exchange rate ($\dot{reer}$). The former can be either the growth of partners' real imports or GDP (foreign demand). The coefficient on market growth will be greater or less than one depending on whether export market share is increasing or decreasing. The negative coefficient on the $\dot{reer}$ (the elasticity of exports to the real effective exchange rate) means that competitiveness losses reduce export growth. Users can add more dynamics (for example, lags of the explanatory variables) or a supply term such as potential GDP growth, which can better reflect domestic characteristics. The market growth and any potential growth terms will affect the projections for exports depending on the openness of the economy, output, and consumption. The coefficient on the $\dot{reer}$ is an important one for the MFT's simulation properties.

Real imports:

$$\dot{m} = \delta_1 \dot{y} + \delta_2 \dot{reer} + \varepsilon_t .$$

Import growth ($\dot{m}$) depends on GDP growth ($\dot{y}$)—a proxy for domestic demand—and the change in the real effective exchange rate ($\dot{reer}$). If import penetration is rising (m/y is increasing), the coefficient on GDP

[1] Other more complex dynamics to impose a unitary long-term elasticity can also be considered, such as including an error correction term equal to the lagged value of $\dot{c} / \dot{yd}$ minus the average or estimated long-term value of the ratio.

growth will exceed one. An appreciating exchange rate will also increase import growth as the relative price of imports in that situation is assumed to be declining. Users can add lagged variable terms, if needed, to change the dynamic response of the equation.

Inflation:

$$\dot{p} = \theta_1 (\dot{p}_{-1}) + (1 - \theta_1) (\dot{p}t) + \theta_2 (gap) + \theta_3 (\dot{p}m - \dot{p}m_{ss}) + \varepsilon_t .$$

The inflation equation is of the short-term expectations-augmented Phillips Curve type, where a positive output gap (*gap = (actual GDP − potential GDP)/potential GDP*) raises inflation, which is usually measured by the change in the CPI. A positive output gap indicates that the actual GDP has exceeded the potential GDP, and the economy is in a state of excess demand, fueling an increase in prices. Inflation expectations are assumed to depend on lagged inflation as well as the implicit or explicit value of the authorities' inflation target ($\dot{p}t$). Apart from the domestic inflationary pressures, inflation depends on the growth in import prices ($\dot{p}m$) in domestic currency. In economies where the policy goal is not to fully anchor domestic inflation to foreign inflation, import prices should be adjusted for their trend growth ($\dot{p}m_{ss}$). In that case and given that the coefficients on lagged inflation and the inflation objective add up to one (homogeneity of inflation), inflation would converge to the authorities' inflation objective if the output gap closed. The presence of the inflation objective can be also understood by rewriting the inflation equation in deviation from the trend inflation (inflation objective) as a function of the lagged deviation, output gap, and import prices.

Solving these five equations will produce an equilibrium for real GDP, but it may not be a steady-state equilibrium, because the output gap will not be closed in each period. The MFT's five equations could be transformed into one equation as a function of real GDP, exogenous variables (including policy assumptions), and parameters. For example, real private consumption and investment are functions of real GDP growth, inflation, and exogenous variables (interest rates, factor incomes, and so on). Real exports and imports are functions of real GDP growth, inflation, and exogenous variables (exchange rates, foreign prices). Meanwhile, inflation is also a function of real GDP and other exogenous variables (potential GDP, inflation target, foreign prices). After adding these GDP components, real GDP becomes a reduced form as a function of exogenous variables and parameters, and this one equation will solve for an equilibrium of real GDP.[2] The solution would not necessarily be a steady-state equilibrium, because there is no explicit mechanism that the projected GDP would converge to the exogenously determined potential output. Therefore, the output gap may persist for a while, pushing for adjustments in prices and other variables. Whether the potential gap would be closed over time depends on the specification of MFT equations and the formulation of policy and exogenous variables over the projection period.[3]

The standard MFT equations reflect the short- to medium-term relationships between variables. The equations do not feature an intercept or a constant term because such a constant, interpreted within the MFT, would be akin to an exogenous time trend in the equation, implying that the variable grows exogenously at some rate above the rate of the explanatory variables.[4] There is also no explicit specification of the long-term relationships between variables and their steady-state values (except for the inflation equation), and in this context, the standard MFT is meant to generate projections over the short- to medium-term horizon. However, the standard MFT could be modified to cover a longer-term projection horizon by modifying the MFT equations to converge to the long-term trends and relationships (for example, by adding

[2] This is comparable to the Expenditure-Output model or the Keynesian Cross that determines the equilibrium level of real GDP by the point where the aggregate demand in the economy equates with its output.

[3] The standard accounting-based FPP framework does not impose any steady-state condition on its projection.

[4] Annex 1 discusses the technical aspects of the MFT equation, including the coefficients that reflect the short- and long-term elasticities and determine the long-term convergence and relationships among variables.

error correction terms) and formulating assumptions on policy and exogenous variables to help achieve convergence.

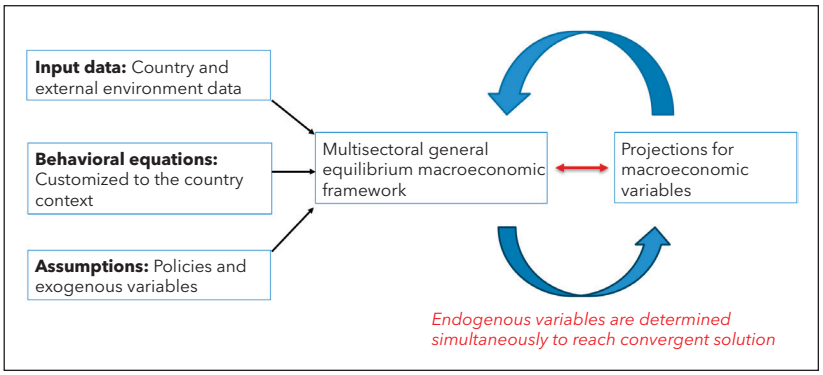
Formulating appropriate policies over the medium term is also critical. For example, if the economy is operating below its potential and the fiscal or monetary policies are too tight, the output gap may not be closed over the medium term with repercussions for other macroeconomic variables. Therefore, users should be aware of the steady-state or long-term trend of the explanatory variables in making assumptions during the projection years and incorporating them in the equations to help ensure convergence to a steady-state equilibrium. Alternatively, users could explore other macroeconomic projection tools, such as the CAEM or QMFF that uses error correction models or trend-and-gap specification if they are interested in a longer-term projection horizon and data availability is not an issue.

In addition to these five core equations, there are other equations in the MFT for specific purposes. For example, a simple function links the output gap to an estimate of cyclical unemployment based on Okun's law to make projections for labor market indicators. Other equations include money demand equation used for monetary projections, a cyclical tax model for fiscal revenue projections. Users could choose whether to keep or change these equations and coefficients when making projections.

C. MFT Operations in Excel

Based on the preceding structure and design of the MFT, the process for building and operating the MFT using an Excel file could be summarized in a simple six-step process (Figure 4). The process for generating projections requires the following inputs: country and external environment data, well-specified behavioral equations, and assumptions on policy and exogenous variables. Users should prepare these inputs and incorporate them into a multisectoral general equilibrium framework to produce projections using an Excel file. The recommended six-step process is as follows: collecting input data, performing consistency checks, customizing behavioral equations, verifying policy and exogenous variables, solving the framework to generate projections, and analyzing projection results and building scenarios.

Figure 4. MFT: Building and Operating the Tool



Six-Step Process for Building and Operating the MFT

- **Step 1:** Collecting input data.
- **Step 2:** Analyzing input data and performing consistency checks.
- **Step 3:** Customizing behavioral equations.
- **Step 4:** Verifying policy and exogenous variables.
- **Step 5:** Solving the framework to generate projections.
- **Step 6:** Analyzing projection results and building scenarios.

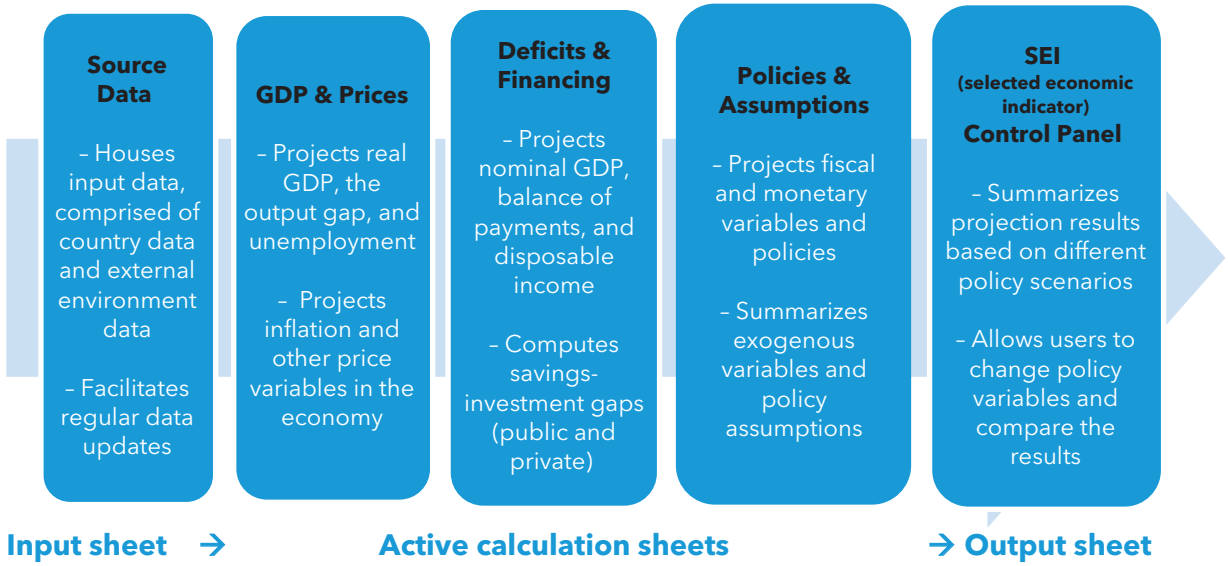
Source: IMF staff

The MFT uses one Excel file with six worksheets (Figure 5).

- The **"Source Data"** sheet stores input data, comprising country data and external environment data.
- The next three sheets (**"GDP & Prices," "Deficits & Financing," and "Policies & Assumptions"**) present the active calculation process for generating projections based on the MFT's macroeconomic framework, behavioral equations, policy assumptions, and exogenous variables.
- The last two sheets (**"SEI"** or selected economic indicator and **"Control Panel"**) present the projection results under the baseline and alternative scenarios and provide a one-stop location where users could change policy variables and then compare the associated projection results.

The MFT uses the Goal Seek function in Excel to solve the framework and obtain an internally consistent solution. Because the MFT uses only one Excel file, a problem of circular reference will arise if two or more variables are simultaneously determined across different cells within the Excel file. The MFT overcomes this problem by using the Goal Seek function, which starts with an initial value of GDP that feeds into the expenditure equations to generate GDP projection and then iterates the process until the value of GDP projection remains unchanged. Although the use of one Excel file and Goal Seek provides various advantages (easy to operate, transparent linkages among variables, and so on), it also has disadvantages if the MFT equations are modified to become more complex (for example, adding endogenous variables to the MFT equations would require additional Goal Seek operations). Therefore, MFT users should be familiar with the operation of the standard MFT first before modifying the framework.

Figure 5. MFT: Workflow in Excel



Source: IMF staff.

The MFT Excel template accompanying this User Manual has been populated with data from a hypothetical country "Macrofoundland" to provide examples of MFT operations. The MFT is not a ready-to-use tool, because it needs to be built and customized to a specific country, and in this context, this Manual is not meant to provide detailed instructions to operate the Macrofoundland file. This Manual is intended to provide guidance for building the MFT and the Macrofoundland file serves as an example

of MFT operations from collecting input data and customizing the MFT to generating projections. The template could also be used as a starting point to develop MFT for a real country. However, replacing Macrofoundland's data with real country data is only the first step because there are additional steps (for example, specifying behavioral equations, making assumptions on policy and exogenous variables) that need to be completed before the MFT could generate projections. The projection for public debt generated by the MFT template has been fully reconciled with that of the Public Debt Dynamics Tool (DDT).[5]

[5] The MFT template includes the DDT Input sheet to present the projections generated by the MFT in a specific format used for input to the DDT, and the DDT Output sheet to present the DDT's debt projections consistent with the MFT's projections. However, debt projections under the DDT's stress test scenarios must be done in a separate DDT template, and the availability of the DDT Input sheet in the MFT template would facilitate the process. See Acosta-Ormaechea and Martinez (2021).

IV. Building and Operating the MFT

This chapter elaborates the six-step process for building and operating the MFT based on the design and structure discussed in Chapter III.

A. Preparation: Writing a Statement of Purpose

Before diving into the six-step process for building the MFT, users should consider writing a statement of purpose to clarify the use of the MFT and identify the requirements to develop it. The statement could be short, but it should contain the purpose, projection calendar, tasks, responsibilities, and the expected MFT customization (sectoral aggregation, projection horizon, focus on certain sectors or specific policies, and so on). Making plans for a projection run is important because the MFT is flexible and allows users to modify the structure and make projections that may not make sense if not properly defined from the start. Policymakers may also have specific interests in sectors or policies, and the statement of purpose could help users and policymakers anticipate the type of analysis that can or cannot be delivered by the MFT. Circulating the statement of purpose for review, internally and among other macroeconomic forecasting institutions, could increase project visibility and buy-in by both the lead agency and other stakeholders. Technical staff may need to discuss with their management or policymakers to set a proper expectation of what the MFT can and cannot do. Having clear expectations from the start will help prepare for unforeseen circumstances.

B. Step 1: Collecting Input Data

The first step in operating the MFT Excel file is to build input data by populating the "Source Data" sheet. The "Readme" sheet provides general guidance for operating the file, including setting the country name, the first year of projection, and definition of the public sector. The standard MFT template could incorporate 12 years of historical data and produce 5 years of projections, although the template could also work for country data with a fewer number of years. Users should copy and paste the hard values of all input data, comprising country data and external environment data, in the yellow-shaded cells (Figure 6). Because input data are entered hard-coded, they remain unchanged if users update the template by moving the first year of projection one column to the right (for example, from 2024 to 2025). Therefore, users should copy and paste the historical data by one column to the left to make sure they correspond to the correct years and then enter new input data for the last year of historical data (2024).

Country Data

Once the length of historical data series is decided, it is important to populate country data for all historical years. Data for the last completed year are particularly important because they serve as the basis for generating projections, and the projection formula will not work if there are missing values. Completing data for all historical years is also important to provide users with sufficient context, such as for viewing equation fit or tracking historical trends. Although missing values of the earlier years may be less critical, it may create problems in analyzing the historical fit of the projection equations. Therefore, missing data should be filled with best estimates or informed guesses that could be reevaluated at a later stage. The purpose of data collection during this first step is to ensure no missing values to be able to generate projection results. Accuracy is less important at this stage because data gaps can be filled with better estimates later.

Figure 6. Macrofoundland: MFT Source Data Sheet

Year/Variable	2012	13	14	15	16	17	18	19	20	21	22	23	First Year of Projection 2024	25	26	27	28
National Accounts: Expenditure, constant prices, local currency (LC) in billions																	
Private consumption	915.60	935.95	985.62	1,049.06	1,112.38	1,160.77	1,226.69	1,283.43	1,240.12	1,321.95	1,389.54	1,435.09					
Public consumption	109.72	116.61	121.65	130.04	132.58	133.67	137.44	146.16	153.37	153.46	159.41	171.85					
Gross capital formation	286.03	278.98	305.06	362.64	407.31	406.24	460.41	497.82	437.76	534.38	555.86	566.98					
Private capital formation	219.62	234.95	263.80	307.61	362.93	353.24	408.89	446.26	378.97	480.49	502.33	500.32					
Public capital formation	66.41	44.03	41.25	55.03	44.38	53.01	51.52	51.56	58.79	53.89	53.54	66.66					
Exports of goods and services (G&S)	313.51	341.88	376.74	383.14	416.85	431.84	447.99	465.03	334.04	431.23	501.66	503.50					
Imports of goods and services (G&S)	409.00	400.06	419.17	465.38	503.18	488.21	529.84	560.63	479.29	602.30	689.00	660.96					
Real GDP *	1,220.73	1,280.24	1,375.51	1,465.44	1,568.03	1,635.97	1,740.20	1,838.63	1,725.07	1,915.54	2,019.09	2,077.72					
CHECK: Statistical Discrepancy GDP-(C+G+I+X-M)	*4.88*	*6.89*	*5.62*	*5.94*	*2.10*	*−8.34*	*−2.49*	*6.82*	*39.07*	*76.81*	*101.61*	*61.26*					
National Accounts: Expenditure, current prices, LC in billions																	
Private consumption	1,253.33	1,341.92	1,466.54	1,591.35	1,720.79	1,848.67	2,025.09	2,165.20	2,174.17	2,507.00	2,869.83	3,105.75					
Public consumption	165.12	191.61	214.45	230.88	251.50	291.17	322.00	353.49	393.91	432.80	497.15	561.59					
Gross capital formation	402.19	409.20	466.53	521.85	560.12	631.67	764.43	855.04	853.09	1,169.97	1,453.99	1,394.31					
Private capital formation	308.80	344.62	403.44	442.66	499.09	549.25	678.88	766.48	738.53	1,051.98	1,313.95	1,230.39					
Public capital formation	93.38	64.58	63.09	79.19	61.03	82.42	85.55	88.56	114.57	117.99	140.04	163.92					
Exports of goods and services (G&S)	410.59	461.53	5,150.92	533.20	593.65	630.39	678.32	736.73	590.76	801.14	966.88	1,035.52					
Imports of goods and services (G&S)	564.62	577.93	621.46	637.50	675.61	706.54	845.19	892.34	811.05	1,169.55	1,409.76	1,378.09					
Nominal GDP *	1,670.21	1,833.84	2,057.97	2,243.96	2,451.10	2,661.86	2,945.09	3,193.56	3,139.66	3,754.90	4,382.39	4,712.74					
CHECK: Statistical Discrepancy GDP-(C+G+I+X-M)	*3.60*	*7.52*	*−4,619.02*	*4.18*	*0.66*	*−33.50*	*0.44*	*−24.56*	*−61.23*	*13.54*	*4.32*	*−6.35*					
National Accounts: Production, constant prices, LC in billions																	
Agriculture	84.78	87.21	89.32	91.41	96.57	102.19	107.81	112.22	115.40	118.45	124.42	127.41					
Manufacturing	335.86	368.26	401.60	432.31	460.41	486.72	523.93	556.73	528.59	626.14	620.30	635.24					
Services	698.71	721.30	768.36	815.49	866.88	899.28	950.63	990.27	912.42	984.07	1,063.57	1,089.19					
Factor cost adjustment (taxes minus subsidies)	101.39	103.47	116.23	126.22	144.16	147.78	157.83	179.41	168.65	186.89	210.80	225.87					
Real GDP *	1,220.73	1,280.24	1,375.51	1,465.44	1,568.03	1,635.97	1,740.20	1,838.63	1,725.07	1,915.54	2,019.09	2,077.72					
Prices and Unemployment, *percent (for 5.3% enter 5.3)*																	
Unemployment rate	8.24	9.01	8.37	7.18	6.94	5.62	5.77	6.29	5.95	7.24	5.40	6.08					
Consumer Price Index (CPI), average	3.62	4.73	2.94	0.82	1.58	3.21	3.49	1.81	3.71	8.08	7.74	4.69					
Consumer Price Index (CPI), end period	3.83	3.80	1.55	2.30	1.66	4.12	1.15	3.66	5.44	8.33	7.67	3.50					
Inflation target	5.50	5.00	4.50	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00					
Interest and Exchange Rates, *percent unless indicated (for 5.3% enter 5.3)*																	
Policy rate	5.00	6.25	6.25	5.25	5.50	5.50	5.50	4.75	3.00	3.25	7.75	6.75					
Representative market rate, average	8.07	6.07	6.45	5.90	6.05	6.30	5.70	6.12	5.37	4.24	7.99	10.10					
Average lending rate (domestic currency)	15.48	13.59	13.90	14.88	15.08	13.91	12.53	12.49	10.98	9.61	11.85	13.93					
Average lending rate (foreign currency)	6.86	6.62	6.52	6.36	6.02	5.90	5.77	5.71	4.51	3.49	4.68	7.80					
Share of foreign currency lending (%)	17.28	20.34	20.54	21.48	21.09	20.44	20.77	21.10	19.66	17.34	20.00	20.28					
Exchange rate (Local currency/US$, end period)	39.52	41.88	43.39	44.60	45.73	47.28	49.23	51.87	57.06	56.20	54.88	55.86					
Exchange rate (Local currency/US$, average)	38.49	40.91	42.63	44.09	45.10	46.54	48.48	50.22	55.34	55.95	53.90	55.86					
Real Effective Exchange Rate % appreciation	−0.95	−5.02	−2.40	3.84	0.53	−3.62	−4.14	−0.30	−7.63	−2.87	8.67	1.36					
Nominal Effective Exchange Rate % appreciation	−0.09	−2.85	−2.02	2.80	−0.60	−3.09	−3.30	−0.94	−6.42	0.31	8.59	−0.35					
Balance of Payments, US$ millions																	
Current account																	
Goods & services balance	−3,875.41	−2,620.24	−2,303.21	−2,167.83	−1,833.58	−1,434.93	−2,843.89	−2,811.76	−3,788.75	−5,662.37	−8,168.23	−6,028.75					
Oil imports: share of total G&S (%)	23.23	22.23	19.16	12.67	11.20	13.63	15.40	14.51	9.94	13.07	16.48	14.64					
Oil exports: share of total G&S (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
Primary income from abroad	−1,640.50	−2,080.61	−2,273.18	−2,055.48	−2,277.17	−2,655.66	−2,584.19	−2,848.23	−2,677.50	−3,297.35	−3,017.70	−3,806.32					
Secondary income from abroad	2,736.51	2,903.32	3,057.25	3,327.10	3,540.46	3,997.42	4,503.03	4,828.46	5,530.14	7,080.01	6,601.70	6,771.66					
Government grants	3,444.29	2,153.48	1,470.76	67,310.32	716.59	1,292.41	1,432.17	1,548.44	1,693.18	1,849.07	2,018.61	2,203.70					
Current account balance (US$)	−2,779.40	−1,797.53	−1,519.14	−896.21	−570.29	−93.17	−925.05	−831.53	−936.11	−1,879.71	−4,584.23	−3,063.41					
Reserves and financial flows																	
Gross international reserves	2,920.69	3,728.26	3,833.52	4,117.08	4,846.97	5,216.48	5,799.75	6,594.38	7,989.91	9,512.47	10,500.94	10,588.58					
Net international reserves	2,246.87	3,070.55	3,255.31	3,636.54	4,232.69	4,746.28	5,338.98	6,146.98	7,526.13	9,060.07	10,065.27	10,156.38					
Foreign direct investment (FDI), net inflow	2,391.13	1,119.93	1,669.71	1,559.11	1,761.27	2,518.53	1,921.15	1,980.44	1,722.42	2,344.79	2,773.12	2,884.04					
External debt																	
Total external debt	18,838.13	20,658.44	21,521.22	20,688.14	22,152.84	23,479.98	24,106.97	26,101.61	31,109.54	32,110.08	32,287.61	34,263.71					
Short-term external debt	2,852.96	2,958.53	3,061.70	2,689.43	2,613.81	2,244.85	1,911.17	1,498.56	2,254.95	2,384.84	3,248.13	3,168.05					

(Continued)

Figure 6. Macrofoundland: MFT Source Data Sheet *(Continued)*

Year/Variable	2012	13	14	15	16	17	18	19	20	21	22	23	First Year of Projection 2024	25	26	27	28
Government Accounts, current prices, LC in billions																	
Revenues																	
Tax revenue	215.58	245.52	272.23	286.94	314.04	345.34	384.96	423.77	385.42	541.78	604.53	678.32					
Nontax revenue	6.12	9.32	14.87	18.21	22.71	23.46	33.39	33.47	44.54	42.08	59.40	64.25					
Grants	3.44	2.15	3.61	67.38	0.78	1.40	0.68	0.73	10.75	2.58	1.61	4.79					
Expenditure																	
Total expenditure	330.45	338.84	348.15	374.32	414.36	454.22	484.84	570.41	689.22	699.79	811.30	905.65					
Domestic interest spending	39.35	41.45	49.02	56.08	66.93	76.36	85.66	103.52	114.39	125.90	139.06	153.53					
External interest spending	12.39	14.37	17.80	23.06	28.94	32.99	37.78	50.38	55.82	60.54	66.33	73.35					
Acquisition of nonfinancial assets	83.34	54.88	41.74	48.14	40.74	47.74	44.93	48.06	52.15	57.60	75.54	101.94					
Financing																	
External budget financing (in local currency)	77.75	60.43	42.13	−49.98	37.01	57.73	59.28	58.43	247.52	55.64	121.48	114.56					
Public debt																	
External debt (in Local currency)	386.83	474.05	528.26	535.39	592.91	655.26	774.61	881.22	1,268.73	1,380.36	1,488.50	1,654.42					
Domestic debt (in local currency)	320.01	382.62	391.51	467.37	544.43	646.56	721.74	829.86	963.08	1,006.36	1,121.09	1,210.89					
Monetary Survey, current prices, end period, LC in millions																	
Net Foreign Assets (NFA)	49,311	86,217	105,569	109,355	135,641	174,511	219,420	256,422	435,895	463,548	458,549	506,533					
o.w., Monetary Authorities	50,659	91,171	113,353	143,879	176,210	210,406	252,944	311,450	394,012	454,764	476,615	523,549					
Net Domestic Assets (NDA)	498,387	527,348	562,785	641,129	688,208	727,446	744,917	823,813	872,399	1,020,862	1,120,710	1,299,212					
Claims on government	295,739	317,154	332,460	384,221	424,046	450,343	456,880	510,901	511,888	569,603	593,879	637,610					
Credit private sector	362,895	417,293	498,726	561,863	629,873	693,772	771,073	862,411	908,307	1,013,730	1,182,328	1,415,100					
Exogenous Global Indicators, *percent unless indicated (for 5.3% enter 5.3*																	
Partners' real GDP	3.68	3.28	3.08	2.72	1.08	2.02	1.89	0.83	−4.95	6.27	3.45	3.06	2.89	2.61	2.42	2.42	2.40
Partners' nonoil imports	2.17	5.11	6.91	5.08	1.03	4.96	5.46	−0.48	−5.90	13.25	5.62	−1.04	1.10	2.93	3.06	3.10	2.99
Partners' nonoil export deflators (US$)	2.15	−2.33	−1.42	−7.25	−4.29	6.28	6.87	2.98	7.84	36.80	0.99	−3.75	0.34	1.76	2.21	1.88	1.90
Partners' CPI (US$)	3.12	2.46	2.37	1.56	1.99	2.70	3.09	3.31	2.48	4.39	8.24	6.57	7.94	3.70	2.96	2.63	2.49
Average petroleum spot price (APSP)	0.99	−0.88	−7.53	−47.15	−15.02	22.45	29.36	−10.36	−32.01	65.81	39.15	−16.36	−2.46	−6.27	−4.23	−2.65	−1.33
Foreign interest rate	0.69	0.41	0.33	0.48	1.06	1.48	2.49	2.32	0.69	0.20	2.85	5.58	5.52	4.64	3.83	3.62	3.30
Doodle pad to facilitate calculation																	

Source: IMF staff.

Recording input data using international statistical standards will facilitate data analysis and help preserve the consistency of macroeconomic framework. These standards provide definitions, classifications, and accounting rules for measuring economic concepts, such as output, prices, current account balance, international reserves, government finance, and others. The IMF provides TA on macroeconomic statistics to all member countries and compiles and presents input data by following the recommended IMF standards. Many countries continue to use country-specific presentation for certain purposes (for example, budget document submitted to Parliament), and users should spend extra efforts to convert this country-specific presentation into the international standard for the MFT. This will help ensure that (1) the MFT's macroeconomic projections are consistent with the international standards in terms of definition and presentation and (2) the accounting relationship across sectors is preserved, which is critical for the consistency of the macroeconomic framework.

Because the priority of the MFT is to minimize data input needs while ensuring macroeconomic consistency, some variables are created by transformations of other data. For example, data on GDP statistical discrepancy is calculated from other GDP components, the fiscal balance is calculated from fiscal revenue and expenditure, and financial and capital accounts data in the BOP are derived from the current account and changes in gross international reserves. External budget financing in the BOP and domestic

budget financing in the monetary survey are linked to fiscal data. There are other transformations to ensure macroeconomic consistency and minimize input data, and these interlinkages could be seen in Figure 3 in Chapter III. Using these derived variables would be useful in countries with data constraints because it would minimize data needs and help ensure the consistency of the macroeconomic framework.

There could be some differences between input data recorded in the sheet "Source Data" and the same data reported by official statistics even when both follow the international statistical standards. The common sources of these differences include the use of different definitions or coverage of variables, different exchange rates for converting data from foreign to local currency, or different sources of data collection. More accurate data for the country may be available, but at this stage the primary focus is on macroeconomic consistency across sectors. If needed, some input data created by transformation could be replaced at a later stage by data reported in the official statistics provided the overall consistency of the macroeconomic framework is maintained.

External Environment Data

It is recommended to use external environment data for both historical and projection years from official sources. The choice between global and trading partners' data depends on the country context and data availability. If the country depends heavily on a few trading partners, then specific trading partners' data could be used instead of global indicators. In this case, external data must be constructed manually, for example, by creating a weighted average of external demands or foreign prices based on data from each trading partner. Because the quality of external environment data plays an important role in generating projections, confirming the reliability and sources of these projections is critical. If the official sources are not available, the external data can be taken from the IMF's World Economic Outlook (WEO) database that has global and country projections five years ahead.[6]

Preserving Input Data Structure

The structure of the "Source Data" sheet should not be changed in this early stage to avoid upsetting the correspondence between data cells. Deleting or inserting columns or rows should be avoided to preserve the structure of input data. These possible changes can be made later during the customization process after the user is more familiar with the MFT operations. Maintaining the level of aggregation in the template at this stage is also important. If the purpose statement calls for a greater level of detail for some economic sectors, the details will be added later once the preliminary customization of the MFT is working to produce its first projections.

At the bottom of the sheet "Source Data," there is an optional "Doodle Pad" that can be used to transform data. For example, users could calculate the contribution to GDP growth by components, expenditure deflators, private disposable income, real interest rates, or calculate percent changes of some variables. Data series created in the Doodle pad are not linked to other cells in the calculation sheets.

Some data may not be available, and the main challenge is to find alternative data while retaining consistency within the data set and ensuring that economic identities are satisfied. Therefore, if substituting alternative data, users may have to create additional balancing items to ensure the adding-up constraints hold. In turn, any balancing item would need to be projected by either making it exogenous or based on a simple principle, for example, making the balancing item a share (percent) of another variable. The objective is to match up historical series and avoid a discontinuity when generating projections.

[6] To help project variables over a longer horizon (such as for debt sustainability analysis), it is useful to specify a simple process that converges the variable (share, growth rate, and so on) to a well-defined steady state. For instance, $y_t = \rho y_{t-1} + (1 - \rho) y_{ss} + \varepsilon_y$ projects y_t using a simple AR(1) process toward its long-term value y_{ss} and users can choose the innovations ε_y to impose a desired path.

The "Source Data" sheet provides a database that feeds into other active calculation sheets to produce a preliminary snapshot of the macroeconomic framework. Although these data are fully completed, it remains to be confirmed whether these data are consistent across sectors to produce a coherent picture of macroeconomic developments during the historical period. The following step will discuss the process to check for data errors and inconsistencies.

C. Step 2: Analyzing Input Data and Performing Consistency Checks

After the input data are populated, users should verify data quality and consistency within and across sectors. This verification process provides the opportunity to understand the country context, familiarize with the projection process and its input requirement, and perform basic calculations for troubleshooting and debugging the data for consistency purposes. Although the focus is on the **"Source Data"** sheet, users need to devote time to check the interlinkages, calculations, and derivations of variables in other sheets (**"GDP & Prices," "Deficits & Financing,"** and **"Policies & Assumptions"**) and make the needed corrections in the **"Source Data"** sheet. Checking the key macroeconomic indicators during the historical years in the **"SEI"** sheet is important to verify whether these indicators make sense.

At the variable level, each variable should be checked for any errors, such as inconsistent units, missing observations, or incorrect definition. The following are common problems:

- **Wrong unit:** Some data may be recorded with wrong units, for example, using local rather than foreign currency, factors of 1,000 (for example, million in place of billion), or a wrong sign for exchange rate appreciation or depreciation. For example, bilateral rates are expressed as local currency per US$; hence, a positive change denotes a depreciation. However, the nominal and real effective exchange rates are expressed as US$/local currency and positive changes mean appreciation. Another example, percentages in the **"Source Data"** sheet need to be entered as a factor of 100 (for example, 5.3 percent needs to be inputted as 5.3).
- **Incorrect calculation or formatting:** For example, some variables expressed in percent of GDP may appear inappropriately scaled or inconsistent with economic common sense. Large differences between actual and fitted value of the MFT equations may indicate that the equation incorporates explanatory variables with the wrong units or scale. Excel errors, such as dividing by zero or incorrect cell formatting, may arise from missing observations. Users should check and correct the cell format and fill in any missing values.

At the sectoral level, users should verify that all variables add up within and across sectors and produce coherent macroeconomic indicators. Although the MFT template has been set up to help ensure consistency across sectors, compiling country data from different sources and recorded using different formats may produce inconsistent macroeconomic indicators for a variety of reasons.

- **Within each sector:** Users should verify that the headline indicators add up and make sense. For example, in the real sector, the contributions to growth from each GDP component should sum to the overall growth, and the trends in inflation, nominal exchange rates, and real exchange rates should be broadly consistent with each other. In the external sector, all BOP flows, including the changes in international reserves, should sum to zero. In the fiscal sector, revenues, expenditures, and overall balance should sum to the financing components. In the monetary sector, the net foreign assets, net domestic assets, and broad money should add up and make sense in terms of GDP.

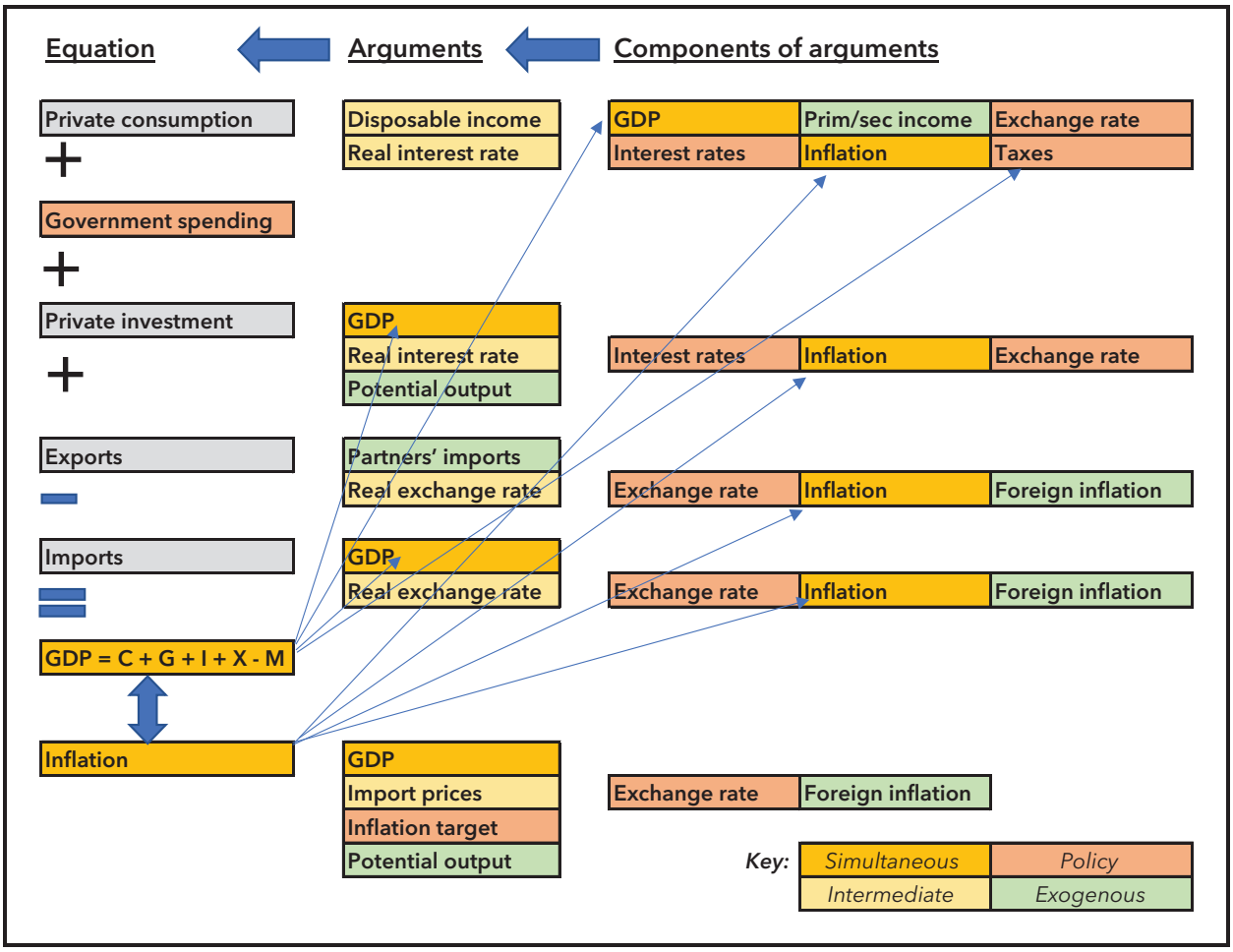
- **Across different sectors:** Ensuring that historical country data are consistent across sectors is critical to produce a coherent picture of recent macroeconomic developments that serve as the basis for generating projections. For example, users could verify whether the decomposition of the overall S-I balance (current account balance) into the public S-I balance (fiscal balance) and the private S-I balance makes sense. Another consistency check is to verify whether the sources of external fiscal financing (recorded in the BOP) and domestic (recorded in the monetary survey) sum to the overall fiscal balance. Users should verify whether key macroeconomic indicators (GDP growth, inflation, balance of payment, gross reserves, fiscal balance, public debt, and so on) presented in the **"SEI"** sheet are broadly consistent with those reported in the country's official statistics. Comparing the SEI table produced by the MFT with the SEI tables published in the IMF Article IV Consultation Staff Report is also useful. These key indicators may not be the same across different sources, but users should be aware of any large differences and identify the sources of the differences. The goal is to make sure that any differences in key economic indicators between the MFT and the country's official statistics or the IMF estimates are not caused by errors in recording and processing input data.

D. Step 3: Specifying Behavioral Equations

The structure and specification of the MFT's five behavioral equations reflect simultaneity and transmission across different variables and sectors. Figure 7 shows the feedback loops, indicating endogenous variables determined simultaneously, exogenous variables determined by assumptions, policy variables based on specific policies, and other intermediate variables. The fact that many variables are simultaneously determined means that the impact of one variable on another, which is reflected by the equation's coefficient, goes through several rounds of iterations (direct and indirect).

Users can choose to stick with the standard specification of MFT equations or change the variables to reflect the country's specific context. However, special care is needed to prevent unplanned simultaneity when modifying these equations, given obvious feedback loops among variables. For example, if users would endogenize the exchange rate as a function of inflation and then feed the exchange rate back into the inflation equation, the system of equations becomes more complex and may not be solvable within one set of equations as envisaged by the standard version of the MFT. In other words, users should recognize that an increased number of feedback loops might require solving for more than one root of the system of equations that the standard MFT is based on. Adding exogenous explanatory variables on the right-hand side may not create potential problems with simultaneity, although users should be aware of potential cross-correlation among variables that could affect the parameter estimates. Users should also consider expressing the explanatory variables as deviations from their steady-state values to help ensure convergent projections.

Figure 7. MFT: Equations, Simultaneity, and Transmissions



Source: IMF staff.

Users should specify the coefficients in each behavioral equation to reflect the country's specific context by calibration or estimations.

- **Calibration** is a process to specify the values of coefficients by adjusting the initial values to produce the best fit for the equation and ensure that the responses to changes in exogenous variables have the desired properties. Calibration can be informed by off-model analysis, such as research carried out elsewhere that suggests ranges of values for coefficients such as trade elasticities or the sensitivity of demand components to income or interest rates. Users could specify the initial values of the coefficient from literature reviews or country-specific information, and then adjust the values after checking the sign, magnitude, and duration of responses.
- **Estimation** is a process to specify the coefficient by directly estimating the equations and coefficients using econometrics techniques. The estimation process may or may not produce the best estimate depending on the econometric techniques chosen, the length and quality of data series, and other factors. Even with good data series and econometric techniques, the estimated coefficient may not yield meaningful results, especially when time series are short and punctuated by structural break. The estimates of the coefficients should be treated with caution particularly if the sign and magnitude are not consistent with the expectations based on economic theory.

There is no standard methodology to specify the behavioral equations and their coefficients, and in many cases expert judgments play an important role. There are a few key principles to follow, however:

- Making sure that the signs and magnitudes are consistent with economic theory and within the normal range of values is desirable to ensure that the MFT projections are coherent from an economic perspective. It is also important to verify that the coefficients would not produce explosive projections that prevent them from converging to the steady-state equilibrium over the long term.
- Specifying the equation coefficient based on its historical performance (fit) is a useful starting point, and having a longer series of historical data is useful to calibrate the coefficients based on visual inspection. However, past data may not be a reliable guide if the economy went through structural changes or if the standard equation is too simple in reflecting the complex relationship among variables given the specific country context.
- The overall goal in specifying the coefficients is to improve forecast accuracy and minimize potential errors, and users can make judgments based on various factors, including (1) using literature reviews and cross-country estimates of the coefficients (price and income elasticities, export and import elasticities, and so on); (2) country-specific estimates that are available in the country; (3) goodness-of-fit indicators; and (4) users' judgments considering the country-specific factors such as the quality and availability of data, the structure of the economy, the determinants of consumption, investment, exports, imports, and inflation, and so on.
- Checking the performance of the coefficients in producing baseline projection (discussed in next step 4) by incorporating baseline policies and exogenous variables is critical. Users may need to iterate the calibration process, starting with the initial values of coefficients, policy assumptions, and exogenous variables, and then revise them iteratively to ensure that the baseline projections have the desired properties (for example, responding well to changes in assumptions, maintaining economic meaning with signs of convergence toward a steady state, and so on).
- Assessing the overall behavior of the framework by a set of core scenarios and simulations will inform users about the suitability of the calibration. Typically, shocks to foreign variables (such as trading partners' output and prices, global commodity prices, risk spreads, and foreign interest rates) and shocks to key domestic macroeconomic variables (such as changes in monetary and fiscal policies) are the ultimate tests to determine the calibration. Knowing the limitations of the model guides users about the need for expert judgment in specific situations.

The "GDP & Prices" sheet in the MFT Excel template presents the behavioral equations and the comparison between the actual and predicted values (Figure 8). The MFT Macrofoundland template has been set up by using generic equations in line with standard economic theory, and the template calculates the fitted values of these equations based on input data. For each equation, the sheet presents (1) the actual values (for example, actual growth rates in real private consumption); (2) the fitted values (for example, growth rates estimated by the equation); and (3) the residual (or add factor). The sheet also provides several charts showing the equation coefficients, the comparison between the actual and fitted values for visual inspection.

A critical part of specifying the behavioral equation is to consider the relevant variables. By clicking the cells on fitted values of each component of real GDP by expenditure in the **"GDP & Prices"** sheet, users can see the formula and trace all variables used in the formula. Some explanatory variables are calculated in other sheets, for example, real private disposable income calculated in the **"Deficits & Financing"** sheet and changes in real effective exchange rate calculated in the **"Policies & Assumptions"** sheet. Users should verify several exogenous variables directly inputted in the **"GDP & Prices"** as follows:

- The growth of potential output is needed to project inflation, and users can enter the values of potential growth in hard numbers based on assumptions. Users can also add a separate sheet to estimate the

potential growth, but it is important to keep the potential growth exogenous in the basic MFT to avoid creating additional simultaneity. The projection for potential output is critical in any macroeconomic forecast, and an estimate of future sources of growth including productivity and demographic development will drive the potential output toward the long-term anchor.[7]

- The inflation target is also needed to project inflation, and users should enter the inflation target based on monetary policy stance or assumptions. If there is no inflation target in the country, then users should make sure to modify the MFT equation to avoid linking it to cells with missing values.
- The Okun coefficient and the estimate of structural unemployment are needed to project unemployment using a simple Okun's rule driven by the output gap.
- The shares of oil exports and oil imports are needed to calculate exports and import deflators during the projection years.
- The share of foreign currency lending in the banking system is needed to calculate the average of real lending rates for projecting private consumption and investment.
- External environment data are taken from input data, and they are needed for generating projections, such as exports, imports, GDP deflators, and the nominal and real effective exchange rates.

The predicted values during the projection years are not yet meaningful at this early stage, because the assumptions of exogenous and policy variables (important inputs for projections) have not been verified. The values of the add factors also do not mean much at this stage as these add factors could be used at a later stage to make an informed judgment on the nature of projections not explained or captured by the behavioral equation, their intuition, and the accuracy of the projections. This will be discussed further in step 5. For each of the behavioral equations, users can experiment with different coefficient values and analyze the behavior of the equation, corresponding residuals, and overall model. By changing the equations' coefficients and the values of exogenous variables, users can see to what extent the properties of the equations change at a partial equilibrium setting and as an overall solved system.

[7] The potential growth is unobservable and could be estimated and projected exogenously using various approaches such as filtering techniques, and structural and common production function approach that include productivity and demographic variables.

Figure 8. Macrofoundland: MFT Equations, Actual, and Fitted Values

Year/Variable	2020	21	22	23	First Year of Projection 2024	25	26	27	28
Real Expenditure, *[Units], constant prices*									
Consumption	1,393	1,475	1,549	1,607	1,676	1,758	1,848	1,944	2,045
Growth rate	–2.5%	5.9%	5.0%	3.7%	4.3%	4.9%	5.1%	5.2%	5.2%
Private	1,240	1,322	1,390	1,435	1,495	1,568	1,647	1,732	1,820
Actual	–3.4%	6.6%	5.1%	3.3%	4.2%	4.9%	5.0%	5.1%	5.1%
Fitted	–0.1%	8.1%	5.0%	-0.2%	4.2%	4.9%	5.0%	5.1%	5.1%
Add factor	–3.3%	–1.5%	0.1%	3.4%					
Public	153	153	159	172	180	190	201	213	225
Growth rate	4.9%	0.1%	3.9%	7.8%	4.9%	5.4%	5.7%	5.8%	5.8%
Gross capital formation	438	534	556	567	603	646	676	711	746
Growth rate	–12.1%	22.1%	4.0%	2.0%	6.4%	7.1%	4.6%	5.2%	4.9%
Private	411	508	527	526	559	600	627	660	692
Actual	–12.5%	23.6%	3.7%	–0.3%	6.4%	7.2%	4.6%	5.2%	4.9%
Fitted	–8.0%	24.1%	–1.1%	–0.1%	6.4%	7.2%	4.6%	5.2%	4.9%
Add factor	–4.5%	–0.4%	4.8%	–0.2%					
Public	27	26	29	41	44	46	48	51	53
Growth rate	–4.4%	–1.7%	9.8%	43.5%	5.4%	5.3%	5.1%	5.2%	5.1%
Exports of goods and services	334	431	502	503	524	543	562	582	601
Actual	–28.2%	29.1%	16.3%	0.4%	4.1%	3.7%	3.5%	3.4%	3.3%
Fitted	–0.3%	10.7%	–0.4%	–1.4%	4.1%	3.7%	3.5%	3.4%	3.3%
Add factor	–27.9%	18.4%	16.7%	1.8%					
Imports of goods and services	479	602	689	661	659	684	707	733	760
Actual	–14.5%	25.7%	14.4%	–4.1%	–0.3%	3.7%	3.4%	3.7%	3.6%
Fitted	–9.7%	9.1%	9.5%	3.4%	–0.3%	3.7%	3.4%	3.7%	3.6%
Add factor	–4.8%	16.6%	4.9%	–7.5%					
Statistical discrepancy	39	77	102	61	0	0	0	0	0
GDP	1,725	1,916	2,019	2,078	2,144	2,264	2,379	2,503	2,631
Growth rate	–6.2%	11.0%	5.4%	2.9%	3.2%	5.6%	5.1%	5.2%	5.1%
Output Gaps, Unemployment & Inflation, in percent									
Business Cycle									
GDP	1,725	1,916	2,019	2,078	2,144	2,264	2,379	2,503	2,631
Growth rate	–6.2%	11.0%	5.4%	2.9%	3.2%	5.6%	5.1%	5.2%	5.1%
Potential GDP	1,808	1,881	1,975	2,073	2,177	2,286	2,400	2,520	2,646
	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Output gap	–4.6%	1.9%	2.3%	0.2%	–1.5%	–1.0%	–0.9%	–0.7%	–0.6%
Unemployment rate	5.9	7.2	5.4	6.1	6.6	6.4	6.4	6.3	6.2
Structural unemployment	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cyclical unemployment	–0.1	1.2	–0.6	0.1	0.6	0.4	0.4	0.3	0.2
Key Prices									
Consumer Price Index (CPI), average	3.7%	8.1%	7.7%	4.7%	4.4%	3.9%	3.6%	3.5%	3.5%
Fitted	2.0%	4.2%	6.5%	5.9%	4.4%	3.9%	3.6%	3.5%	3.5%
Add factor	1.7%	3.9%	1.2%	–1.2%					
Consumer Price Index (CPI), end period	5.4%	8.3%	7.7%	3.5%					
GDP Deflator	182.0	196.0	217.0	226.8	244.0	254.2	264.2	274.2	284.5
Growth rate	4.8%	7.7%	10.7%	4.5%	7.6%	4.2%	3.9%	3.8%	3.8%
Deflators									
Consumption	184.3	199.3	217.4	228.2	238.2	247.4	256.3	265.2	274.5
Growth rate	4.6%	8.1%	9.1%	5.0%	4.4%	3.9%	3.6%	3.5%	3.5%
Gross capital formation	194.9	218.9	261.6	245.9	255.5	265.7	276.8	288.3	300.5
Growth rate	13.5%	12.3%	19.5%	–6.0%	3.9%	4.0%	4.2%	4.1%	4.2%
Exports of goods and services	176.9	185.8	192.7	205.7	213.6	225.0	238.0	250.9	264.6
Growth rate	11.6%	5.0%	3.7%	6.7%	3.8%	5.3%	5.8%	5.4%	5.5%
Imports of goods and services	169.2	194.2	204.6	208.5	215.6	224.5	235.3	246.5	258.7
Growth rate	6.3%	14.8%	5.4%	1.9%	3.4%	4.1%	4.8%	4.8%	5.0%

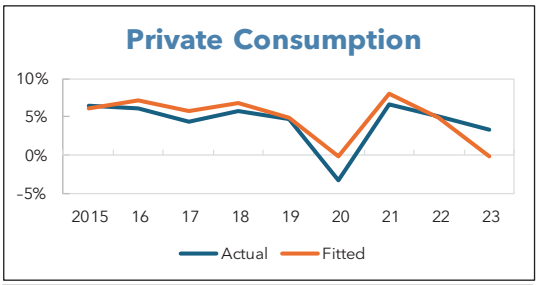
(Continued)

Figure 8. Macrofoundland: MFT Equations, Actual, and Fitted Values *(Continued)*

Behavioral Equations

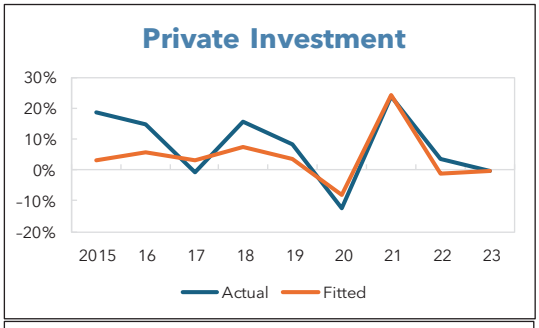
Real Private Consumption Equation

Coefficient on:	
Disposable income	0.70
Lagged consumption	0.30
Real interest rate change	-0.40
Mean Error	-0.5%
Root Mean Square Error (RMSE)	1.8%



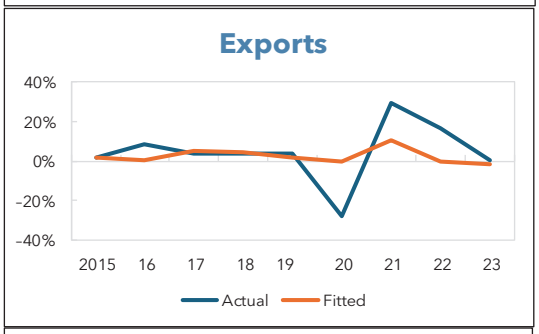
Real Private Investment Equation

Coefficient on:	
GDP acceleration	1.00
Potential GDP	1.00
Real interest rate change	-0.40
Mean Error	3.7%
Root Mean Square Error (RMSE)	7.2%



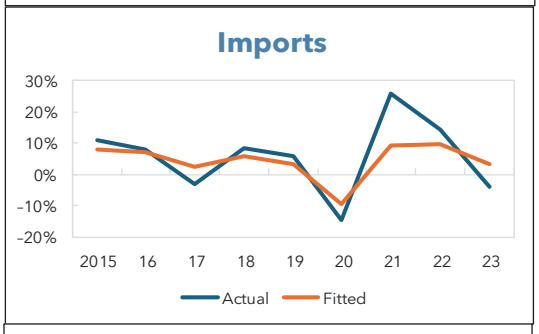
Exports Equation

Elasticity wrt:	
Partners' imports	0.70
Real Effective Exchange Rate (REER)	-0.50
Mean Error	2.0%
Root Mean Square Error (RMSE)	12.8%



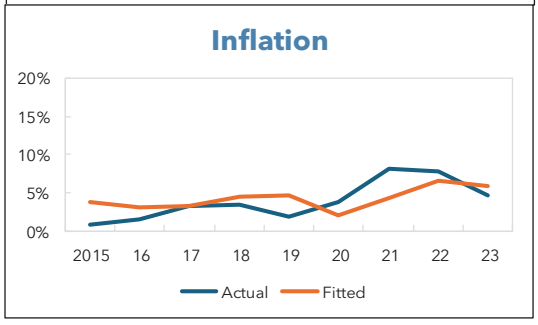
Imports Equation

Elasticity wrt:	
Real GDP	0.95
Real Effective Exchange Rate (REER)	0.50
Mean Error	1.5%
Root Mean Square Error (RMSE)	6.9%



Inflation Equation

Coefficient on:	
Output gap	0.20
Lagged inflation	0.50
Inflation target	0.50
Import prices	0.10
Mean Error	-0.3%
Root Mean Square Error (RMSE)	2.1%



Source: IMF staff.

Finally, users should check and verify how prices and deflators are calculated, linked to other variables, and get transmitted (reverberate or propagate) throughout the macroeconomic framework. Prices and deflators are endogenous variables and play an important role in the MFT because they are combined with real variables to derive the nominal values of macroeconomic variables. These price variables include inflation, foreign prices, exchange rate, interest rate, and GDP deflators. The deflators for GDP components are projected based on weighted averages of other prices in the framework as follows:

- Public and private consumption deflators are projected based on inflation.
- Investment deflators are projected based on inflation and import deflators.
- Export deflators are projected based on the respective shares of oil and non-oil exports, trading partners' oil and non-oil price deflators, and the exchange rate.
- Import deflators are projected based on the respective shares of oil and non-oil imports, trading partners' oil and non-oil price deflators, and the exchange rate.

Users should review and verify the weights to reflect the nature of the economy under analysis. These deflators are used to calculate the overall GDP deflator, and hence the projection for nominal GDP.

E. Step 4: Verifying Policy and Exogenous Variables

The MFT requires policy and exogenous variables to generate projections, and users should formulate and verify these variables while keeping the long-term steady state in mind. The discussion on MFT structure (Chapter III) showed that (1) the MFT projections depend on MFT equations, policy variables, exogenous variables and (2) the MFT is meant to produce short- to medium-term projections with no explicit mechanism to ensure convergence to the steady state over the long term. In this context, it is important that MFT users envisage a steady state in mind when formulating policies and exogenous variables, even if the convergence may take place beyond the projection period.

Ensuring that the baseline projection, which reflects the most likely economic outcome, is well formulated and calibrated is critical in building the MFT. The baseline projection may not converge to a steady state by the end of the projection period, but users should keep in mind that the baseline projection should converge in the long term because otherwise the framework is not well calibrated, or alternatively the projected steady state is unrealistic and therefore should be revised.[8] Users can envisage several steady-state indicators, for example, in terms of growth rates (GDP growth, inflation, interest rate, exchange rate, and so on) and ratios in terms of GDP (shares of GDP components, current account balance, fiscal balance, and so on). Then users could check the signs of convergent trends, whether the output gap is gradually closing, inflation is stabilizing, shares of GDP components in total GDP are converging to their long-term ratios, and so on. Even if a country is in a crisis where external shocks and unsound policies cannot restore the economy to its potential, the potential output will need to eventually adjust to close the output gap because it cannot remain open forever. Users should consider the following general principles in formulating the baseline projection:

- The MFT equations and their coefficients should be well specified to help the projections converge to their long-term steady-state equilibrium (see step 3).
- Policy variables should reflect the most likely policies that will materialize and should reflect the authorities' policies. However, this can be problematic because the authorities' policies are not always

[8] For example, the long-term steady-state projection (y^*) could be assumed as a function of steady-state parameters (parm*), steady-state exogenous variables (x^*), and steady-state policies (p^*). The baseline projection (y^b) is a function of steady-state parameters (parm*), baseline exogenous variables (x^b), and baseline policies (p^b). Although y^b differs from y^* during the projection period, it is important that y^b would converge to y^* in the long term, and this would require that x^b converges to x^* and p^b to p^*. If y^b cannot converge to y^* for any reason, then the realism of y^* should be reevaluated.

consistent with those to achieve the steady state over the long term. For example, fiscal expenditure that continues to grow much faster than the potential GDP growth may jeopardize fiscal sustainability and macroeconomic stability. Maintaining a negative real interest rate for a long time can move inflation away from its target. In practice, users should assess the credibility of the authorities' policy in closing the output gap over the long term before incorporating them in the baseline policy. If the authorities' policies are not credible, then users will have to make judgments on the realism of the baseline policies and to what extent the projected potential growth is achievable.

- Other exogenous variables and external environment data should reflect the most likely outcome and should also be consistent with the path toward a steady state. Users should incorporate country-specific factors to reflect the reality, but they should also make judgments whether these exogenous variables are broadly consistent with the path toward a steady state. For example, if the growth of foreign direct investment and government investment continue to be less than the potential GDP growth, the economy may never achieve its potential growth. External environment data, such as global oil and food prices, trading partners' GDP, foreign inflation, foreign exchange rate, and so on can be projected based on the IMF WEO or other trading partners' official projections to help ensure a convergence path.
- In practice, formulating and calibrating the baseline scenario may require multiple iterations. This is to ensure that the MFT equations, policy assumptions, and exogenous variables reflect the most likely outcome during the projection period and are consistent with closing the output gap over the long term.

Policy Variables

The fiscal and monetary policies are presented on the top sections of the "Policies & Assumptions" sheet. The places where users could make discretionary changes are marked in yellow-shaded cells. There are generally two separate rows: "Baseline," which represents the baseline policy scenario, and "Scenario" or "Measures," which represents the alternative scenario deviating from the Baseline. As an example, Figure 9 presents the baseline fiscal and monetary policies in Macrofoundland.

Figure 9. Macrofoundland: Fiscal and Monetary Policies

Year/Variable	2022	23	First Year of Projection 2024	25	26	27	28
Government Budget, *[Units], current prices*							
Total revenue	666	747	818	900	982	1,073	1,170
	13.5%	12.3%	9.4%	10.0%	9.2%	9.2%	9.1%
Tax revenue	605	678	743	817	893	975	1,063
	11.6%	12.2%	9.5%	10.0%	9.2%	9.2%	9.1%
Nontax revenue	59	64	71	78	86	94	102
	41.2%	8.2%	11.0%	10.0%	9.2%	9.2%	9.1%
Grants	2	5	3	4	4	4	5
	-37.4%	197.0%	-31.4%	9.2%	9.2%	9.2%	9.2%
Total Expenditure	811	906	964	1,029	1,103	1,199	1,299
	15.9%	11.6%	6.5%	6.7%	7.2%	8.7%	8.3%
Noninterest expenses	530	577	632	692	757	829	908
	16.4%	8.8%	9.5%	9.5%	9.5%	9.5%	9.5%
		Baseline	9.5%	9.5%	9.5%	9.5%	9.5%
		Scenario/Measures	0.0%	0.0%	0.0%	0.0%	0.0%
Interest	205	227	221	215	212	224	230
	10.2%	10.5%	-2.5%	-2.7%	-1.5%	5.4%	3.1%
Domestic	139	154	123	124	129	138	145
External	66	73	98	91	83	86	86
Acquisition of nonfinancial assets	76	102	112	122	134	147	160
	31.1%	34.9%	9.5%	9.5%	9.5%	9.5%	9.5%
		Baseline	9.5%	9.5%	9.5%	9.5%	9.5%
		Scenario/Measures	0.0%	0.0%	0.0%	0.0%	0.0%
Net lending (=overall balance)	-146	-158	-147	-130	-121	-126	-129
Government Budget, in percent of GDP							
Total Revenue	15.2	15.9	15.6	15.6	15.6	15.6	15.6
Tax Revenue	13.8	14.4	14.2	14.2	14.2	14.2	14.2
Model 1: unitary tax elasticity	14.4	13.8	14.2	14.2	14.2	14.2	14.2
Add factor/measures	-0.6	0.6	0.0	0.0	0.0	0.0	0.0
Model 2: cyclical tax ratio	14.8	14.5	14.3	14.4	14.4	14.4	14.4
Add factor/measures	-1.0	-0.1	0.0	0.0	0.0	0.0	0.0
Nontax revenue	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Grants	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Total expenditure	18.5	19.2	18.4	17.9	17.6	17.5	17.4
Noninterest expenses	12.1	12.2	12.1	12.0	12.1	12.1	12.1
Interest	4.7	4.8	4.2	3.7	3.4	3.3	3.1
Domestic	3.2	3.3	2.4	2.2	2.1	2.0	1.9
External	1.5	1.6	1.9	1.6	1.3	1.3	1.1
Acquisition of nonfinancial assets	1.7	2.2	2.1	2.1	2.1	2.1	2.1
Net lending (overall balance)	-3.3	-3.4	-2.8	-2.3	-1.9	-1.8	-1.7
Government & Financing, *[Units], current prices*							
Net budget financing	146	158	147	130	121	126	129
Domestic	24	44	22	4	-11	-9	-12
External	121	115	124	126	132	136	141
Other debt creating financing (net)							
Domestic	90	46	50	55	60	65	71
External (including ER revaluation)	-13	51	120	4	142	11	165
Public debt							
Consolidated public debt	2,610	2,865	3,182	3,371	3,693	3,895	4,260
% GDP	59.5%	60.8%	60.8%	58.6%	58.8%	56.7%	56.9%
Domestic debt	1,121	1,211	1,284	1,342	1,391	1,447	1,506
% GDP	25.6%	25.7%	24.5%	23.3%	22.1%	21.1%	20.1%
Change in domestic debt	115	90	73	59	49	56	59
Estimated change in domestic debt	115	90	73	59	49	56	59
Difference	0	0	0.0	0.0	0.0	0.0	0.0
External (Forex) debt	1,488	1,654	1,899	2,029	2,302	2,448	2,754
% GDP	34.0%	35.1%	36.3%	35.3%	36.6%	35.7%	36.8%
Memo:							
Net external financing in US$	2	2	2	2	2	2	2

(Continued)

Figure 9. Macrofoundland: Fiscal and Monetary Policies *(Continued)*

Year/Variable	2022	23	First Year of Projection 2024	25	26	27	28
Monetary Policy Rule & Exchange Rate, *in percent*							
Interest Rates							
Policy rate	7.8%	6.8%	5.0%	5.0%	4.5%	4.3%	4.2%
		Baseline	5.0%	5.0%	4.5%	4.3%	4.2%
		Additional rate change	0.0%	0.0%	0.0%	0.0%	0.0%
Representative market rate, average	8.0%	10.1%	6.8%	6.8%	6.3%	6.1%	6.0%
Market rate/Policy rate differential	0.2%	3.3%	1.8%	1.8%	1.8%	1.8%	1.8%
Average lending rate (domestic currency)	11.9%	13.9%	10.6%	10.6%	10.1%	9.9%	9.8%
Differential with market rate	3.9%	3.8%	3.9%	3.9%	3.9%	3.9%	3.9%
Average lending rate (foreign currency)	4.7%	7.8%	4.0%	4.0%	3.5%	3.3%	3.2%
Differential with market rate	-3.3%	-2.3%	-2.8%	-2.8%	-2.8%	-2.8%	-2.8%
Memo:							
Foreign interest rate	2.9%	5.6%	5.5%	4.6%	3.8%	3.6%	3.3%
Taylor Rule							
Taylor Rule	9.9%	6.6%	5.5%	5.4%	5.3%	5.3%	5.3%
Difference: Market Rate minus Taylor Rule	-1.9%	3.5%	1.3%	1.4%	1.0%	0.8%	0.7%
CPI inflation (average)	7.7%	4.7%	4.4%	3.9%	3.6%	3.5%	3.5%
CPI inflation (end period)	7.7%	3.5%					
Inflation expectations	5.9%	4.3%	4.2%	3.9%	3.8%	3.8%	3.7%
Inflation target (mid)	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Output gap	2.3%	0.2%	-1.5%	-1.0%	-0.9%	-0.7%	-0.6%
Equilibrium interest rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Exchange Rates							
Exchange rate (LC/US$, average)	53.9	55.9	57.8	59.8	61.9	64.1	66.3
	-3.7%	3.6%	3.5%	3.5%	3.5%	3.5%	3.5%
		Baseline	3.5%	3.5%	3.5%	3.5%	3.5%
		Additional rate change	0.0%	0.0%	0.0%	0.0%	0.0%

Source: IMF staff

At this stage, users can use either the "Policies & Assumptions" or the "Control Panel" sheets to specify fiscal and monetary policies. In this early stage of building the MFT, users may have not formulated certain policies or remain unsure whether the MFT would work for generating projections. In this case, users can enter the specific policies directly in the **"Policies & Assumptions"** sheet to check whether the MFT will produce the expected projections. Once the MFT works and the policy is well formulated, users can enter the policy in the **"Control Panel"** sheet and then link it to the appropriate cell in the **"Policies & Assumptions"** sheet. The use of the **"Control Panel"** in building alternative scenarios will be discussed further in step 6.

Fiscal Policy

Most fiscal variables during the projection years are determined by policy assumptions, including government revenue, expenditures, and the sources of fiscal financing.

- **On the revenue side**, users can select one of two simple tax models. Model 1 assumes a unitary tax elasticity with respect to GDP, implying an unchanged tax/GDP ratio. Model 2 assumes a full-employment tax ratio but adjusted by the output gap to capture the tendency of tax ratios to be procyclical. Both models include add factors, which can be used to inject tax measures during the projection period. These models essentially treat the effective average tax rate as exogenous and thereby avoid the circularity between disposable income and taxes, which depends on GDP, which in turn depends on disposable income through the consumption function. Finally, nontax revenue is

determined by assumptions, and grants are also set exogenously based on assumptions in the BOP (in the **"Deficits & Financing"** sheet). In general, MFT users can anchor the long-term revenue projection based on a revenue/GDP ratio consistent with the steady state.

- **On the spending side**, users should set the growths of noninterest expenses (current spending) and the acquisition of nonfinancial assets (capital spending) during the projection years based on fiscal policies. Under the baseline scenario, these expenditures can be set by following the country's state budget or medium-term development plan. The standard MFT template does not distinguish between government spending on consumption and wages (which should affect government consumption in the national accounts) and on transfers or subsidies. If data on government transfers or subsidies are available, users can include them to have a better estimate of disposable income (GDP minus taxes plus transfers). Users can disaggregate government spending based on data availability to improve projection accuracy and facilitate specific policy analysis.
- **On the financing side**, users should set the amount of external fiscal financing exogenously and leave the domestic financing as residual. Users should also make assumptions on other debt-creating flows that are not related to budget financing based on historical experiences.
- **The MFT also generates projections for the cyclically adjusted primary fiscal balance** by using a simple formula to calculate the cyclical components of the primary balance based on output gaps and tax and expenditure elasticities (see Fedelino, Ivanova, and Horton 2009).

Monetary Policy

The main monetary policy variables are the interest rate and exchange rate, and they are formulated depending on the policy regime. The standard version of the MFT sets the interest rate and exchange rate exogenously, and they are independent from the monetary or exchange regimes. Users need to formulate monetary policies that reflect the authorities' current policy stance over the near term while ensuring that the path of interest rate and exchange rate over the medium term would be in line with the steady-state policies over the long term. This places the responsibility on the user to exercise judgment in determining interest rates and exchange rates based on whether the country operates under a pegged, floating, or hybrid exchange rate regime. It also implies that the MFT can be adapted to different policy regimes, although users must apply judgment to interpret the country's specific policies and integrate them into the MFT.

- **For a pegged exchange rate regime**, the exchange rate can be determined by incorporating inflation differentials with trading partners to maintain a stable real effective exchange rate (REER). Although it is common to assume a constant REER, users may also account for country-specific factors that can drive long-term appreciation or depreciation. These include changes in productivity, competitiveness, fiscal stance, demographics, capital control, and financial market development, among others. In addition, the openness of capital flows, shifts in risk perception, and broader macroeconomic variables play a crucial role. It is also essential to consider the impact of foreign interest rates and other external factors to appropriately adjust domestic monetary policy. The policy interest rate can be set in line with the central bank's policy rate in the near term and then converging to a rate that is consistent with the (explicit or implicit) inflation target over the long term. Another option is to set the interest rate by aiming at a constant real interest rate consistent with the long-term steady-state condition. The MFT template calculates the interest rate based on a Taylor Rule equation where the interest rate is a function of the inflation gap, the output gap, the equilibrium interest rate, and other parameters. The Taylor Rule based interest rate can provide useful guidance for MFT users to evaluate and manually change the policy rate accordingly.
- **For a floating exchange rate regime**, users can introduce an equation to endogenize the exchange rate, incorporating factors such as interest rate differentials, inflation differentials, degree of capital

mobility, and other exogenous variables. When specifying the equation, it is important to consider the authorities' specific monetary policy objectives (for example, inflation targeting, nominal output targeting, or other objectives) as well as the primary monetary policy instruments used to achieve them. Endogenizing the exchange rate to reflect a floating exchange rate also means that the interest rate should be set appropriately, for example, using a Taylor Rule approach. While modifying the standard MFT to reflect a floating exchange rate regime is feasible, it adds complexity to the framework. This raises the question whether an alternative projection tool is more suitable, particularly because the MFT equations lack forward-looking behavior, an essential feature for accurately modeling the exchange rate (see Chapter V).

- **For a mixed or hybrid regime**, the formulation of monetary policies will depend on specific objectives of the authorities. Users must exercise judgment in adjusting the structure of the MFT and in formulating the exchange rate and interest rate to accurately reflect the authorities' policy goals.

Other Exogenous Variables

Users should check and verify the remaining exogenous variables that are needed for generating the baseline projection. Some variables (potential GDP, structural unemployment, and so on) are already discussed in step 3, while fiscal and monetary policy variables are discussed in the preceding sections. For the remaining exogenous variables, users can project the values based on country-specific information or assumptions. Users should familiarize themselves with the MFT structure and the financing of external balance (discussed in Chapter II) in specifying exogenous variables in the BOP and monetary sector. In specifying these exogenous variables, users should also consider the medium-term steady-state values of these variables to help ensure convergence to steady-state projections over time.

- **In the BOP**, export and import projections are taken from GDP while government flows are taken from fiscal and the other remaining components (primary and secondary incomes, foreign direct investment, and private capital flows) during the projection years and are projected based on assumptions in the **"Deficits & Financing"** sheet. The primary and secondary incomes are used to calculate Gross National Disposable Income (GNDI), an important determinant of private consumption and key component of the current account or the S-I balance of the economy. Users can determine the values of these BOP variables using country-specific factors, off-model analysis, or assumptions that help achieve convergence (for example, growing in line with potential GDP).
- **In the monetary sector**, a simple income velocity of money (GDP/Broad Money) equation projects broad money based on a user-supplied estimate of trend velocity and interest rate sensitivity term (in the **"Deficits & Financing"** sheet). Other exogenous assumptions include the projections for Other Items Net of the Monetary Survey and the share of banks' loans in foreign currency that is needed to calculate the weighted average of foreign and domestic interest rates.
- **External environment data** comprising of trading partners' or global macroeconomic indicators are taken from input data in the **"Source Data"** sheet. Users should verify the values of these assumptions before generating projections.

The summary of all assumptions on policy and exogenous variables that are used to generate projections under the "Active" scenario is presented at the bottom of the "Policies & Assumptions" sheet (Figure 10). The "Active" scenario is the current scenario in which the MFT is operating, and it can be the baseline or alternative scenario depending on the actual run. The rows marked with **bold fonts** represent policy variables determined by policy assumptions. The summary table is meant to help users check and verify these assumptions. If modifications are needed, the changes should be made in the original location in which those assumptions are specified.

Figure 10. Macrofoundland: Assumptions on Policy and Exogenous Variables

	First Year of Projection 2024	2025	26	27	28
REAL SECTOR					
Potential GDP growth rate	5.0%	5.0%	5.0%	5.0%	5.0%
Structural unemployment rate	6.0%	6.0%	6.0%	6.0%	6.0%
EXTERNAL SECTOR					
Current account					
Primary income from abroad	-4,016	-4,237	-4,470	-4,715	-4,975
Secondary income from abroad					
Government grants	2,135	2,253	2,376	2,507	2,645
o.w. Budget grants	57	60	63	67	70
Other	4,819	5,084	5,364	5,659	5,970
Net inflows (capital and financial account)					
Bank (net)	-26	-27	-29	-30	-32
Nonbank private inflows, FDI (foreign direct investment)	2,430	2,564	2,705	2,853	3,010
Nonbank private inflows, Others	-1,852	-1,954	-2,062	-2,175	-2,295
IMF (net)	0	0	0	0	0
Oil imports: share of total G&S	14.6%	14.6%	14.6%	14.6%	14.6%
Oil exports: share of total G&S	0.0%	0.0%	0.0%	0.0%	0.0%
FISCAL SECTOR					
Tax revenue-to-GDP ratios					
Model 1: Unitary tax elasticity	14.2	14.2	14.2	14.2	14.2
Model 2: Cyclical tax ratio, parameters:					
Full employment tax ratio	14.5				
Sensitivity of tax ratio to gap	1.0				
Nontax revenue (percent of GDP)	1.4	1.4	1.4	1.4	1.4
Elasticity of tax revenue to the output gap	1.0	1.0	1.0	1.0	1.0
Elasticity of expenditures to the output gap	0.0	0.0	0.0	0.0	0.0
Total expenditure					
Noninterest expenses, percent change.	9.5%	9.5%	9.5%	9.5%	9.5%
Acquisition of nonfinancial assets, percent change	9.5%	9.5%	9.5%	9.5%	9.5%
Interest rate on domestic debt	9.9%	9.4%	9.4%	9.7%	9.8%
Interest rate on external debt	5.5%	4.6%	3.8%	3.6%	3.3%
Budget Financing					
Budget financing: Other debt creating financing (net), domestic	50	55	60	65	71
Net external financing in US$	2	2	2	2	2
MONETARY SECTOR					
Money Demand: Income Velocity Function					
Trend velocity	0.0				
Interest sensitivity	2.0				
Policy rate	5.0%	5.0%	4.5%	4.3%	4.2%
Market rate / Policy rate differential	1.8%	1.8%	1.8%	1.8%	1.8%
Market rate / avg. lending rate differential (Domestic currency)	3.9%	3.9%	3.9%	3.9%	3.9%
Market rate / avg. lending rate differential (Foreign currency)	-2.8%	-2.8%	-2.8%	-2.8%	-2.8%
Inflation target (mid)	4.0%	4.0%	4.0%	4.0%	4.0%
Taylor Rule:					
Coefficient on inflation gap	0.5				
Coefficient on output gap	0.5				
Equilibrium interest rate	2.0%	2.0%	2.0%	2.0%	2.0%
Share of FX lending (for calculation of weighted interest rate)	20.3%	20.3%	20.3%	20.3%	20.3%
Monetary survey: Other items of NDA (net)	-821,312	-895,231	-975,801	-1,063,623	-1,159,349
Exchange rate (LC/US$, average), % change (+ = depreciation)	3.5%	3.5%	3.5%	3.5%	3.5%
GLOBAL INDICATORS (percent change)					
Partners' real GDP	2.89	2.61	2.42	2.42	2.40
Partners' nonoil imports	1.10	2.93	3.06	3.10	2.99
Partners' nonoil export deflators (US$)	0.34	1.76	2.21	1.88	1.90
Partners' CPI (US$)	7.94	3.70	2.96	2.63	2.49
Average petroleum spot price (APSP)	(2.46)	(6.27)	(4.23)	(2.65)	(1.33)
Foreign interest rate (percent)	5.52	4.64	3.83	3.62	3.30

Source: IMF staff.

F. Step 5: Solving the Framework to Generate Projections

The projections for endogenous variables are determined simultaneously using an iterative approach based on interlinked behavioral equations and macroeconomic identities. In the MFT Excel template, the system uses the initial values of the endogenous variables, reconciles these values with values derived by the framework, and iterates the process using the Goal Seek function in Excel. This iterative process provides a solution routine that closes the macroeconomic framework and, based on the design of the MFT, produces a convergent solution.

There are two "Goal Seek" routines to achieve consistent projections and close the macroeconomic framework. These Goal Seeks must be carried out for each year of the projection period, and it can be done manually step by step or automatically by creating an Excel macro. Figure 11 presents an example in the MFT Macrofoundland template.

- **The first Goal Seek is in the "GDP & Prices" sheet to reconcile the GDP projections with the national accounts' expenditure identity.** This first Goal Seek is needed because some expenditure components of GDP depend on GDP, which is itself the sum of the components. The Goal Seek function solves this by providing an initial value of GDP to "seed" the expenditure equations and then iterates and adjusts the value of GDP until it is consistent with the value projected by the sum of the GDP components.
- **The second Goal Seek is in the "Policies & Assumptions" sheet to adjust government interest payments to account for changes in public debt.** This second Goal Seek does not affect the projections for GDP and inflation, but it is important for accuracy, especially in fiscal analysis. This is required because the projection for debt interest payment (part of total expenditure and the deficit above the line) depends on the projected stock of debt, which in turn depends on the deficit and financing needs that incorporate the amount of interest payments. This adjustment is only needed for domestic debt because external borrowing is exogenous in the framework. The Goal Seek creates a "seed" value of domestic borrowing, which is added to domestic debt to calculate interest payments. This updates the projections for the fiscal deficit and debt stock and revises interest payments, and so on. The Goal Seek adjusts the change in domestic debt with its calculated value after incorporating the updated interest payments and then iterates the process until the domestic debt remains unchanged.

If the MFT fails to converge or the macroeconomic framework does not close, users should investigate the following potential problems:

- **Data issues:** Missing data, error in recording, or discontinuity of exogenous variables during the historical and projection years can cause calculation errors. An explosive trend of exogenous variables can also prevent the MFT from converging.
- **Formula issues:** Errors in Excel formula or missing links between cells can create problems in generating projections. However, users should not succumb to modifying the formula on every projection run if the results are not expected.
- **Behavioral equations:** The sign and magnitude of the coefficients may be inconsistent with economic theory and push the projections into unstable territory or produce a nonconvergent solution.
- **Endogenous variables:** Users may have modified the standard MFT by adding new endogenous variables or new equations that create additional circularity, preventing the framework from reaching convergence.

Figure 11. Macrofoundland: Solving the Framework to Generate Projections

Goal Seek to determine the equilibrium level of real GDP (in the "**GDP & Prices**" sheet).

Year/Variable	First Year of Projection 2024	2025	2026	2027	2028	
Real Output by Sector, *[Units], constant prices*						
GDP	2,144	2,264	2,379	2,503	2,631	Goal seek:
Growth rate	3.2%	5.6%	5.1%	5.2%	5.1%	Change this row
Check: GDP Expenditure minus GDP Production	0.0	0.0	0.0	0.0	0.0	to make this = zero

Goal Seek to determine the equilibrium level of domestic public debt and interest payment (in the "**Policies & Assumptions**" sheet).

Year/Variable	First Year of Projection 2024	2025	2026	2027	2028	
Domestic debt	1,284	1,342	1,391	1,447	1,506	
% GDP	24.5%	23.3%	22.1%	21.1%	20.1%	
Change in domestic debt	73	59	49	56	59	Goal seek:
Estimated change in domestic debt	73	59	49	56	59	Change this row
Difference	0.0	0.0	0.0	0.0	0.0	to make this = zero

Source: IMF staff.

Users should incorporate high-frequency (daily, monthly, quarterly) data or implement nowcasting methods to complement the MFT in refining the projection results during the current year. It is important to do this outside the MFT to preserve linkages between variables within the MFT and to avoid introducing circularity in the file. Another way to incorporate the short-term impact is to use the add factors in the current year. However, users should not incorporate short-term or transitory events by changing the specification of the MFT equations and parameters.

Users can evaluate and make ad-hoc adjustments to the projections for GDP components, although this discretionary adjustment should be thoroughly scrutinized. Users can change the value of add factor, which is a special row under the fitted growth to manually increase or decrease the projection for total growth (for example, total growth = fitted growth based on the equation + add factor). This discretionary adjustment can be used for smoothing out the projection path or incorporating specific shocks that are difficult to model. For example, these shocks can be in the form of a negative export shock because of emerging trade barriers, or a positive shock driven by a large industry that is expected to come on stream, and these shocks can be incorporated by changing the add factors to lower or raise the overall growth of exports.

When both GDP by expenditure and by production are available, they need to be reconciled. The MFT allows users to think carefully about the story behind the GDP projection. For example, real GDP is projected to grow by 5 percent based on the outlook of sectoral production while real GDP by expenditure on the demand side is projected to grow by 6 percent. In this case, users can consider modifying the original GDP projection on the production side or changing the add factors in GDP projection on the expenditure side to align the two projections. Once the alignment is done and the story makes sense, the expenditure equations in the MFT would drive the all-important simulation properties. The use of the add factors should be done carefully and based on economic reasoning: (1) Users should know which GDP components (for example,

consumption, investment, exports, imports) can be expertly adjusted based on the nature of the shocks and the country-specific circumstances, and (2) the add factors are not meant to be used frequently in each projection run just to make the projection results look good. In summary, good judgment is needed to use the add factor, and the discretionary adjustment should not be used excessively because it can undermine the MFT in generating the projections.

When generating projections for GDP from the expenditure side, users can complete the projections for each sector of GDP by production based on assumptions or exogenous factors. For example, projections for agriculture, manufacturing, and services sectors can be made based on the outlook of each sector. The projections for tax and subsidies, however, should be linked to the fiscal sector. Note that these sectoral GDP projections may not add up to the projection for total GDP, which is projected from the demand side, and therefore, users should create a residual component within the GDP by production to ensure consistency of total GDP between the demand and supply side.

G. Step 6: Analyzing Projection Results and Building Scenarios

Analyzing Projection Results

After the first projection run is completed, users should verify that the results are meaningful and consistent from the macroeconomic perspective. The baseline projections show where the economy is heading based on the baseline policies and exogenous variables. The table on Selected Economic Indicators in the **"SEI"** sheet presents a summary of the MFT projections in each sector that can be used to develop the narrative on macroeconomic outlook. In scrutinizing the projection results, users should answer the following questions: Has the projection achieved the intentions in the written statement of purpose? Does the projection deviate much from the trend in recent years, and what are the possible reasons for those deviations? Does the projection look consistent with the expectation, particularly on the impact of the policies? What is the macroeconomic story that can be told and easily explained? Does the projection show signs of convergence toward the steady state over the long term?

Ultimately, the user is the one making projections, not the MFT, and users' judgment and experience play an important role. The projection results depend on various factors, including input data, behavioral equations, policies, assumptions, and users need to incorporate all these into consideration. To help analyze the projection results, users should compare them with the authorities' official projections, or the IMF's projections published in the WEO. The goal is not to replicate these projections but to identify the differences and analyze the potential reasons.

Once a preliminary baseline projection is completed, users need to test framework properties to gauge how well the existing projection behaves and responds to sensitivity tests. The results should be used to inform any needed adjustments to the framework to ensure coherence, robustness, and logical economic intuition and rationale to guide policy analysis. The idea is to see if policy multipliers (impact of policy changes on GDP and other variables) are in the range of what might be expected, based on either in-country research or cross-country studies. Users will need to be mindful of which variables are kept constant in the simulations, especially interest and exchange rates, and should be aware that the combined effect may lead to different results from the partial effect when one policy variable is kept unchanged. If simulation effects seem out of line, users should trace effects through the framework to diagnose the cause (for example, revisit equation parameters, if necessary). Examples of sensitivity tests are as follows: raising government spending by 1 percent of GDP, raising taxes by 1 percent of GDP, raising the policy or representative interest rate by 1 percentage point, depreciating the exchange rate by 5 percent or applying a combination of interest rate and exchange rate shocks (for example, see Batini and others 2014).

Building Scenarios

After the baseline projection is finalized, users can copy and paste the results into the columns headed "Baseline" on the right side of the "SEI" sheet. Freezing the baseline results is meant to preserve their values for comparison at a later stage with the projections based on the alternative scenarios. Note that once the assumptions on policy and exogenous variables are changed, the projection results in the **"SEI"** sheet under the "Active Scenario" will automatically change and no longer represent the baseline scenario. As an example, Figure 12 presents the Selected Economic Indicators from the MFT Macrofoundland template.

Users can develop alternative scenarios by changing the assumptions on policy or exogenous variables during the projection years. The **"Control Panel"** sheet enables one-stop creation and analysis of alternative policy scenarios by allowing users to modify the preset policy variables and see the impact on key variables of interest. Users can change the assumptions on taxes, expenditures, interest rates, and exchange rates relative to the baseline. If needed, users can create additional rows to capture specific policies. Users should then link these policy changes to the appropriate cells in the **"Policies & Assumptions"** sheet to make sure that the MFT incorporates these new policies in generating projections. As an example, Figure 13 provides a summary of baseline and alternative policies from the MFT Macrofoundland template.[9]

[9] As an illustration, the Macrofoundland example shows that the economy has been operating below its potential in recent years, and under the baseline scenario, GDP growth is projected to increase closer to its potential over the medium term, but the output gap remains open. By raising government expenditures and lowering the interest rate under the alternative scenario, the economy is projected to grow faster, and the output gap will close over the medium term. Inflation will also increase compared with that of the baseline, but it remains below the inflation target.

Figure 12. Macrofoundland: Selected Economic Indicators

Year/Variable	2023	First Year of Projection 2024	Active Scenario 25	26	27	28	Baseline results are copied and pasted here — Baseline Scenario 2024	25	26	27	28
Real GDP growth and the business cycle (percent)											
Actual	2.9	3.7	5.7	5.2	5.2	5.1	3.2	5.6	5.1	5.2	5.1
Potential	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Output gap	0.2	−1.1	−0.4	−0.2	0.0	0.1	−1.5	−1.0	−0.9	−0.7	−0.6
Unemployment rate	6.1	6.4	6.2	6.1	6.0	6.0	6.6	6.4	6.4	6.3	6.2
Real GDP by production, growth (percent)											
Agriculture	2.4	3.3	5.5	3.4	4.4	4.3	2.9	5.4	3.3	4.5	4.3
Manufacturing	2.4	4.1	6.5	5.5	4.0	5.1	3.6	6.3	5.4	4.0	5.0
Services	2.4	2.8	4.5	4.7	5.1	4.4	2.5	4.4	4.6	5.2	4.4
Real GDP by expenditure, growth (percent)											
Consumption	3.7	4.9	5.3	5.4	5.2	5.2	4.3	4.9	5.1	5.2	5.2
Private	3.3	4.8	5.1	5.2	5.1	5.0	4.2	4.9	5.0	5.1	5.1
Public	7.8	5.8	6.2	6.4	6.5	6.5	4.9	5.4	5.7	5.8	5.8
Investment	2.0	7.1	6.8	4.7	5.0	5.0	6.4	7.1	4.6	5.2	4.9
Private	−0.3	7.2	6.9	4.6	4.9	4.9	6.4	7.2	4.6	5.2	4.9
Public	43.5	6.3	6.2	5.9	6.0	5.9	5.4	5.3	5.1	5.2	5.1
Exports of goods and services	0.4	4.0	3.6	3.4	3.3	3.2	4.1	3.7	3.5	3.4	3.3
Imports of goods and services	−4.1	0.2	3.9	3.7	3.8	3.7	−0.3	3.7	3.4	3.7	3.6
Inflation (percent)											
Consumer Price Index (CPI)	4.7	4.4	4.0	3.8	3.7	3.7	4.4	3.9	3.6	3.5	3.5
GDP deflator	4.5	7.7	4.3	4.1	4.0	4.0	7.6	4.2	3.9	3.8	3.8
External position (percent of GDP)											
Current account balance	−3.6	−2.7	−2.4	−2.2	−2.1	−2.1	−2.5	−2.2	−2.0	−1.8	−1.8
Financial and capital account	3.7	3.0	2.8	2.7	2.5	2.4	3.0	2.8	2.7	2.6	2.5
Change in reserves	0.1	0.3	0.4	0.5	0.4	0.3	0.5	0.6	0.7	0.7	0.7
Net international reserves (US$)	10,156	10,443	10,805	11,273	11,722	12,083	10,573	11,133	11,892	12,683	13,464
Reserves in months of imports	5.0	4.9	4.8	4.8	4.7	4.6	5.0	5.0	5.1	5.1	5.2
External debt	40.6	38.0	35.7	33.8	31.9	30.0	38.2	36.0	34.2	32.3	30.5
Fiscal position (percent of GDP)											
Revenue	15.9	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6
Expenditure	19.2	18.4	17.9	17.7	17.7	17.8	18.4	17.9	17.6	17.5	17.4
Balance	−3.4	−2.8	−2.3	−2.1	−2.1	−2.1	−2.8	−2.3	−1.9	−1.8	−1.7
Primary balance	1.5	1.4	1.3	1.2	1.1	0.9	1.4	1.5	1.5	1.4	1.4
Public debt	60.8	60.5	58.1	58.3	56.5	56.9	60.8	58.6	58.8	56.7	56.9
Domestic	25.7	24.4	23.2	22.1	21.3	20.7	24.5	23.3	22.1	21.1	20.1
External	35.1	36.1	35.0	36.2	35.2	36.2	36.3	35.3	36.6	35.7	36.8
Interest and exchange rates											
Local currency/US dollar (average)	55.9	57.8	59.8	61.9	64.1	66.3	57.8	59.8	61.9	64.1	66.3
percent change	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Real effective exchange rate (percent change)	1.4	−6.5	−3.1	−2.6	−2.3	−2.2	−6.6	−3.2	−2.8	−2.6	−2.4
Policy interest rate (percent)	6.8	4.5	4.5	4.0	4.0	4.0	5.0	5.0	4.5	4.3	4.2
Effective average lending rate (percent)	13.4	9.5	9.5	9.0	9.0	9.0	10.0	10.0	9.5	9.3	9.2
International developments (percent change)											
Partners' real GDP	3.1	2.9	2.6	2.4	2.4	2.4	2.9	2.6	2.4	2.4	2.4
Partners' nonoil imports	−1.0	1.1	2.9	3.1	3.1	3.0	1.1	2.9	3.1	3.1	3.0
Average petroleum spot price (US$)	−16.4	−2.5	−6.3	−4.2	−2.6	−1.3	−2.5	−6.3	−4.2	−2.6	−1.3

Source: IMF staff.

Figure 13. Macrofoundland: Baseline and Alternative Scenario

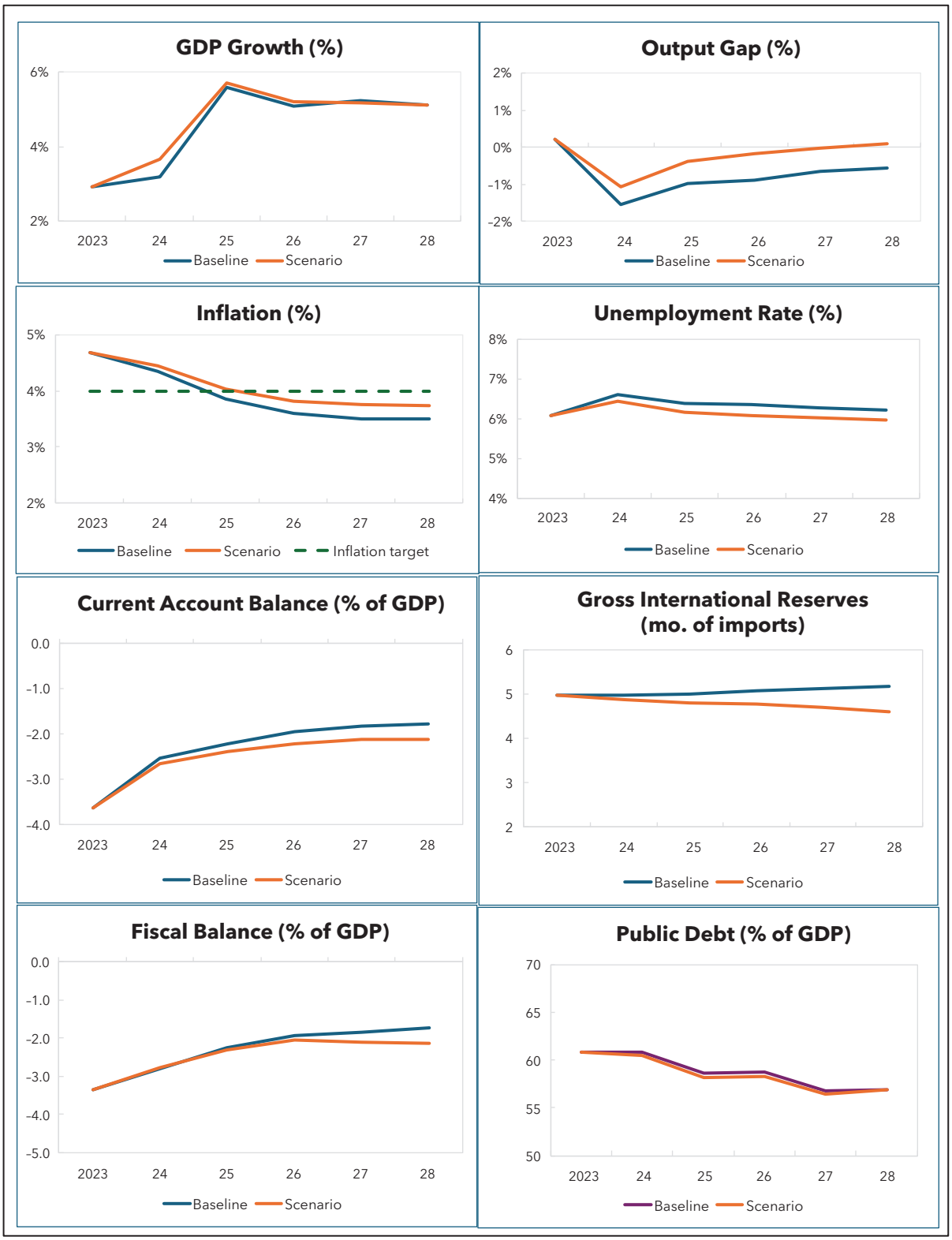
Policy Instruments	2023	2024	25	26	27	28
Fiscal Policy (percent of GDP, unless otherwise indicated)						
Revenue: Baseline	15.9	15.6	15.6	15.6	15.6	15.6
Revenue: Scenario	15.9	15.6	15.6	15.6	15.6	15.6
Additional revenue measures (please specify)	...	0.0	0.0	0.0	0.0	0.0
Changes in revenue (scenario minus baseline)	0.0	0.0	0.0	0.0	0.0	0.0
Expenditure: Baseline	19.2	18.4	17.9	17.6	17.5	17.4
Baseline growth of noninterest expense (% y/y)	...	9.5%	9.5%	9.5%	9.5%	9.5%
Baseline growth of capital expenditure (% y/y)	...	9.5%	9.5%	9.5%	9.5%	9.5%
Expenditure: Scenario	19.2	18.4	17.9	17.7	17.7	17.8
Growth of noninterest expense compared to baseline (% y/y)	...	1.0%	1.0%	1.0%	1.0%	1.0%
Growth of capital expenditure compared to baseline (% y/y)	...	1.0%	1.0%	1.0%	1.0%	1.0%
Changes in expenditure (scenario minus baseline)	0.0	0.0	0.0	0.1	0.3	0.4
Fiscal balance: Baseline	−3.4	−2.8	−2.3	−1.9	−1.8	−1.7
Fiscal balance: Scenario	−3.4	−2.8	−2.3	−2.1	−2.1	−2.1
Changes in fiscal balance (scenario minus baseline)	0.0	0.0	0.0	−0.1	−0.3	−0.4
Monetary Policy (percent)						
Policy rate: Baseline	6.8%	5.0%	5.0%	4.5%	4.3%	4.2%
Policy rate: Scenario	6.8%	4.5%	4.5%	4.0%	4.0%	4.0%
Lower policy rate compared to baseline	...	−0.5%	−0.5%	−0.5%	−0.3%	−0.2%
Exchange rate depreciation (LC/US$): Baseline	3.6%	3.5%	3.5%	3.5%	3.5%	3.5%
Exchange rate depreciation (LC/US$): Scenario	3.6%	3.5%	3.5%	3.5%	3.5%	3.5%
Additional depreciation compared to baseline	...	0.0%	0.0%	0.0%	0.0%	0.0%

Source: IMF staff.

The projection results of the baseline and alternative scenario are presented at the bottom of the "Control Panel" sheet. The "Key Outcomes" table presents main macroeconomic indicators pulled from the **"SEI"** sheet, and a few charts have been automatically generated to aid interpretation. Users can add additional indicators and charts as needed. The example from the MFT Macrofoundland template is presented in Figure 14.

Users should be fully comfortable working with the standard MFT first before modifying the MFT structure. If there is a call for a greater level of details for some economic sectors, the details can be added later once the preliminary version is working. In any case, users should avoid adding excessive details to the MFT because the strength of the MFT is its simplicity. If more details are added, more equations might be needed, and the new equations will require additional explanatory variables, which in turn must be projected or assumed during the projection years.

Figure 14. Macrofoundland: Projections for the Baseline and Alternative Scenario



Source: IMF staff.

V. Customizing to Specific Needs

This chapter presents examples of the MFT customization to meet specific needs, such as incorporating production or supply-side shocks, adding endogeneity to the framework, and disaggregating variables. These require modification of the standard MFT framework and introduction of additional simultaneity that needs to be solved separately. Therefore, users should make sure that the standard MFT is well functioning first before modifying it to incorporate specific needs. Because the MFT's strength is its simplicity, users should also avoid introducing extensive or complicated modifications that make the MFT difficult to operate or produce inconsistent projections. If extending the MFT becomes impractical or unrealistic, users can also explore other macroeconomic projection tools that are more suitable. As the MFT is being further developed, various modifications that are discussed in this chapter could be formally incorporated in the updated version of the MFT that will be published at a later stage.

A. Incorporating Supply-Side Shocks

Although the MFT is a demand-driven macroeconomic framework, the structure can be modified to incorporate supply-side shocks. These supply-side shocks can be caused by natural disasters (flood, drought, and so on), geopolitics, pandemic, or other shocks that directly affect GDP on the production side. Supply-side shocks can be implemented through shocks to potential output, demand components, and prices (cost-push shocks). Since the MFT is a demand-side framework, the supply-side shock can be viewed as a constraint on GDP, forcing it to depend on an exogenously determined value. To accommodate this situation, the MFT can be modified as follows:

- Establish the projection for GDP by production exogenously using a separate analytical tool. This could be done by using a formal model to simulate the impact of supply-side shocks on GDP or by changing the components of GDP production manually (for example, setting growth of agriculture sector exogenously).
- Set the GDP by expenditure in MFT to follow the exogenously determined GDP from the supply side but then invert the GDP identity by making one of GDP components as residual.
- Use Goal Seek to eliminate the difference between GDP by expenditure produced by the MFT and GDP by production that is determined exogenously.

The projections for the remaining endogenous variables continue to follow the MFT process, but the results should be interpreted with caution. The projections for GDP components (other than the one set as a residual), inflation, and other endogenous variables will continue to adjust and follow the MFT framework, ensuring consistency. However, the values of policy and exogenous variables will remain unchanged since they are set exogenously under the baseline scenario. For example, a negative GDP shock may lead to lower inflation and a higher real interest rate (because the nominal interest rate remains unchanged), creating further drag on investment. A negative supply-side shock may decrease or increase inflation (for example, because of supply scarcity) depending on circumstances. Therefore, incorporating a supply-side shock by making the GDP exogenous is only the first step, and the results may not be meaningful unless users make additional modifications to the framework and adjustments to the assumptions on policy and exogenous variables. These additional steps require various judgments based on the specific nature of the supply-side shocks and how to treat these shocks using the MFT with its limitation because it is essentially a demand-side framework.

As an example, Macrofoundland is assumed to suffer from a natural disaster and based on the assessment of the damage collected in the field, real GDP growth is projected to slow down to 2 percent in 2024. In this example, the GDP growth in 2024 could be set exogenously based on the damage assessment, while the projections for GDP during the remaining period of 2025–28 would be kept endogenous. Under this hypothetical example, the MFT can be modified by setting the overall GDP in 2024 exogenously and allowing one or more GDP components adjust as residual. One example is to set private consumption as residual although users can also choose other GDP components to adjust. Then users could perform Goal Seek operation to set the difference between GDP by expenditure and production to zero (Figure 15). As a result, the overall GDP is forced to grow by 2 percent based on the production side, while GDP components would adjust following the MFT's propagation mechanism.

Figure 15. Macrofoundland: Incorporating Supply-Side Shock

	Year/Variable	First Year of Projection 2024	25	26	27	28	
Real Expenditure, *[Units], constant prices*							
Consumption		1,650	1,729	1,815	1,907	2,012	
	Growth rate	2.7%	4.8%	5.0%	5.1%	5.5%	
Private		1,470	1,540	1,615	1,696	1,788	For 2024, set private
	Actual	3.3%	4.8%	4.9%	5.0%	5.5%	consumption as
	Fitted	3.3%	4.8%	4.9%	5.0%	5.5%	residual
	Add factor						(Cp = Y - G - I - X + M)
Public		180	189	200	211	223	
	Growth rate	4.7%	5.2%	5.6%	5.7%	5.6%	
Gross capital formation		596	646	674	708	747	
	Growth rate	5.2%	8.4%	4.2%	5.2%	5.4%	
Private		553	600	626	658	694	
	Actual	5.2%	8.6%	4.2%	5.2%	5.5%	
	Fitted	5.2%	8.6%	4.2%	5.2%	5.5%	
	Add factor						
Public		44	46	48	50	53	
	Growth rate	5.0%	5.0%	4.8%	4.9%	4.7%	
Exports of goods and services		524	544	564	585	605	
	Actual	4.2%	3.8%	3.7%	3.6%	3.5%	
	Fitted	4.2%	3.8%	3.7%	3.6%	3.5%	
	Add factor						
Imports of goods and services		651	676	698	722	750	
	Actual	−1.5%	3.8%	3.2%	3.5%	3.8%	
	Fitted	−1.5%	3.8%	3.2%	3.5%	3.8%	
	Add factor						
Statistical discrepancy		0	0	0	0	0	
GDP		2,119	2,243	2,355	2,478	2,614	For 2024, set GDP equal
	Growth rate	2.0%	5.9%	5.0%	5.2%	5.5%	to GDP by production
							(row 36)
Real Output by Sector, *[Units], constant prices*							
Real GDP from the model (Endogenous)		2,119	2,243	2,355	2,478	2,614	Goal seek:
	Growth rate	2.0%	5.9%	5.0%	5.2%	5.5%	Change this row
Check: GDP Expenditure minus GDP Production		0.0	0.0	0.0	0.0	0.0	to make this = zero
Real GDP Exogenous		2,119					
	Growth rate	2.0%					
Check: GDP Endogenous minus GDP Exogenous		0.0	<- For 2024, used Goal seek to make this = zero by changing row 37				

Source: IMF staff.

Users should be aware of the following considerations regarding this modification:

- Setting one component of GDP as a residual may be unrealistic, and therefore, rather than creating an additional Goal Seek to constrain overall GDP by expenditure, users can manually alter the projection for GDP by using add factors in each GDP component. For example, if the supply-side shock is expected to reduce consumption and investment, users can introduce negative add factors to these components and iterate the process to meet the overall GDP growth of about 2 percent (see Chapter IV, step 5). This process involves a lot of judgment and adding excessive add factors can undermine the MFT in generating projections.
- Note that inflation remains endogenous at this stage because the mechanism for generating projections for inflation in the MFT has not been modified. As a result, inflation is projected to decline compared with that of the baseline because GDP growth is slowing down and the negative output gap is widening. In many cases, negative supply shock can be accompanied by an increase in prices because of supply shortages, and in this case, users can modify the framework by modifying the inflation equation or adding add factors to inflation projection based on off-model analysis or judgments. However, this process is not straightforward, because any changes in inflation would create a feedback loop to GDP projection under the MFT, and the process for projecting GDP based on the supply side will have to be readjusted. At the same time, the potential output growth should be adjusted in response to the shock to make sure that the impact of the shock on the output gap is realistic.
- This highlights the fact that adjusting GDP growth based on exogenous projection is only the first step in incorporating supply-side shocks in the MFT. Users should continue the process by evaluating the realism of various assumptions on policy and exogenous variables and modifying them to produce meaningful projection results.

B. Adding More Behavioral Equations to the MFT

Another customization of the MFT is to add endogenous variables and equations to the framework. The standard MFT treats many variables as exogenous based on assumptions (primary and secondary incomes in the BOP, capital flows, nontax revenues and grants, government spending, interest rate, exchange rate, and so on). This may not be considered appropriate because of the specific country context, and users may want to endogenize some of these variables. However, introducing more endogeneity or feedback loops may create new circularities as the framework becomes more complex. The MFT is designed with a primary focus on simplicity, which, in turn, requires users to exercise judgment in applying the framework. Although it is possible to enhance the MFT's structure by adding complexity, there comes a point where users should evaluate whether transitioning to a more advanced tool, such as the CAEM, QMFF, or DSGE, would be more appropriate (see Chapter II). For those who choose to continue using the MFT while incorporating more endogenous variables, the general approach involves the following steps: (1) identify which variable is simultaneously determined, (2) create a duplicate with fixed values and use this in equations or relationships, and then (3) use Goal Seek to eliminate differences between the duplicate and its twin, whose values would have been calculated by the framework. In general, introducing more endogeneity into the MFT will require additional Goal Seek applications to ensure that the framework remains solvable. The following are examples of adding endogeneity to the framework:[10]

Endogenous interest rates. Interest rates can be endogenized by specifying an equation for interest rates that depends on inflation and output, which are themselves determined by interest rates. With an

[10] For more complex setups, a different tool can be chosen where the solution of a system of nonlinear equations is solved using more advanced techniques. One such approach is to specify the system of equations as a nonlinear least-squares minimization problem and use the MS Excel Solver to iteratively find a solution. This is the approach adopted in other ICD tools and may be issued in the future MFT updates to accommodate the need to solve for multiple roots.

endogenous interest rate, it is also paramount to specify the behavior of the exchange rate to reflect interest rate differentials and the financing of the current account. The **"Policies and Assumptions"** sheet provides a calculation of interest rate based on a simple Taylor Rule. However, if the interest rate projection is directly linked to the Taylor Rule interest rate, then the circularity problem in Excel will arise. To overcome this, users could adjust the interest rate manually by comparing it with the Taylor Rule interest rate. Essentially, the interest rate projection remains exogenous in this case, but users could adjust the interest rate manually by following the calculated interest rate based on the Taylor Rule.

Endogenous exchange rate. Users could use a reduced form equation to endogenize the exchange rate while keeping the MFT's principle of simplicity and flexibility.[11] Note that endogenizing the exchange rate to reflect a flexible exchange rate regime means that the interest rate should be set appropriately (for example, using the previously mentioned Taylor Rule) in response to the changes in exchange rate. In any case, to the extent that the exchange rate is determined by other endogenous variables (for example, inflation, GDP, BOP indicators, and interest rates), this will add a new simultaneity to the MFT. The framework will become more complex and require additional iterations to achieve an equilibrium. Because the MFT uses one Excel file, the problem of circular reference will also arise, and an additional Goal Seek will be needed to find a convergent solution. Users should keep in mind that the exchange rate is a forward-looking variable, whereas the MFT does not incorporate forward-looking behavior. However, if users decide to endogenize the exchange rate using the standard version of the MFT, the process could be approached as follows:

- Make a duplicate copy of the average nominal exchange rate variable (or exchange rate depreciation) and drive this series by the desired exchange rate equation. Calculate the difference between the original exchange rate (which is exogenous under the basic MFT model) and the duplicate driven by the exchange rate equation.
- Use Goal Seek to eliminate the difference between the two exchange rates. Because there are now three goal seeks (GDP, exchange rate, and interest payment), users will need to iterate among them to achieve convergence. Users could set up an Excel macro to help perform with this iteration.
  - As an example, the exchange rate could be made endogenous to reflect the differences between foreign and domestic inflation (for example, higher inflation tends to lead to currency depreciation) and between foreign and domestic interest rates (such as higher interest rates attract capital inflows and appreciate the domestic currency). Figure 16 provides a simple illustration of how this could be done using the MFT template with the following steps:
  - Create new rows under the "Exchange Rates" to calculate inflation differentials and interest rate differentials and then estimate the endogenous exchange rate depreciation based on inflation and interest rate differentials. The simple estimation of depreciation in Figure 16 is only for illustration, and users can opt for a more refined estimation, for example, by using a formal equation that includes a parameter to reflect the degree of capital mobility.
  - Calculate the difference between the endogenous depreciation and the original depreciation, which is determined exogenously by policy assumptions under the standard MFT.
  - Use Goal Seek to eliminate the difference between endogenous and exogenous depreciation. Iterate among three Goal Seeks (GDP, interest payment, exchange rate) to ensure that all differences are zero.

[11] Although an endogenous exchange rate may add realism to the framework in countries with inflation targets and floating exchange rate, the specification of exchange rate equation should be treated carefully. Empirical exchange rate estimations tend to be unreliable, partly because exchange rate is a forward-looking variable and it is difficult to capture new information (for example, unexpected hike in interest rate or changes in risk premium).

Figure 16. Macrofoundland: Endogenizing the Exchange Rate

	Year/Variable	2023	First Year of Projection 2024	25	26	27	28	
105	**Exchange Rates**							
106	Exchange rate (ER, LC/US$, average)	55.9	53.9	53.3	52.6	51.6	50.9	Derived from row 109 and 120
107	Depreciation	3.6%	–3.5%	–1.1%	–1.4%	–1.9%	–1.3%	
108								
109	**Exogenous ER Depreciation (seed value)**		–3.5%	–1.1%	–1.4%	–1.9%	–1.3%	Goal seek: Change this row
110	Difference		0.0	0.0	0.0	0.0	0.0	to make this row = zero
111	**Endogenous ER Depreciation**		**–3.5%**	**–1.1%**	**–1.4%**	**–1.9%**	**–1.3%**	Derived from row 113 and 116
112								
113	**Inflation differential effect**		**–4.0%**	**–0.7%**	**–0.7%**	**–1.0%**	**–1.1%**	
114	Domestic inflation from the framework (endogenous)		3.9%	3.0%	2.2%	1.6%	1.4%	
115	Foreign inflation (from Source Data)		7.9%	3.7%	3.0%	2.6%	2.5%	
116	**Interest rate differential effect**		**0.5%**	**–0.4%**	**–0.7%**	**–0.9%**	**–0.2%**	
117	Domestic interest rate (Policy rate)		5.0%	5.0%	4.5%	4.5%	3.5%	
118	Foreign interest rate (from Source Data)		5.5%	4.6%	3.8%	3.6%	3.3%	
119								
120	**Additional ER depreciation (add factors)**		0.0%	0.0%	0.0%	0.0%	0.0%	

Source: IMF staff.

C. Disaggregating Taxes and GDP Components

Disaggregating tax variables into several types of taxes, rates, and tax bases would require modification of the standard MFT framework if the tax bases are endogenous. Tax affects disposable income, consumption, and GDP, which in turn affects tax, creating circularity problems. The standard MFT avoids this circularity by specifying the tax variable as tax/GDP ratio (see Chapter IV, step 4). Users could modify this specification, for example, by creating separate projections for various taxes using different tax rates and tax bases, such as consumption, nominal GDP, or imports. This modification could be useful if users prefer to formulate tax policies using specific tax rates or nominal values or implement specific tax measures in levels instead of in percentage of GDP. However, if the tax bases (for example, nominal GDP, imports) are endogenous, this modification introduces circularity that can be resolved as follows:

- Create duplicate series for the tax bases (for example, consumption, nominal GDP, or imports) and make them exogenous, and then calculate tax revenues based on these tax bases using appropriate tax models.
- Create a series equal to the difference between the duplicate tax base and the value calculated in the model.
- Use Goal Seek to adjust the exogenous values of the tax bases until differences with the calculated values of the tax base are eliminated.
- As more tax components create additional simultaneity, the number of Goal Seek solutions will also increase. In this context, users should assess whether it would be more effective to transition to a different tool instead of Excel or to develop a complementary satellite tool for analyzing various tax types and then integrate the results into the MFT.

Disaggregating the expenditure components of GDP implies that additional equations are needed to project the disaggregated component. There are several possibilities of disaggregation, including

splitting inventories out of gross capital formation, separating exports and imports into separate goods and services components, or having separate equations for oil and non-oil trade variables.

- Users should specify new equations to project the newly disaggregated components of GDP, but before that the data will need to be added, and the GDP expenditure identity modified to account for all separate components.
- If the new equations include endogenous variables, users should be mindful of adding new simultaneity that may need to be solved separately.
- Users should check the calculations of price deflators to ensure that they reflect any new split of expenditure components and correctly link to create nominal expenditure components in the **"Deficits & Financing"** sheet.

Disaggregating the production side of the GDP could also be useful to focus on specific sectors. In the oil-exporting countries, for example, oil production plays a critical role in economic activities, exports, and fiscal revenues, and detailed projections for these variables would be useful. Annex 2 provides examples for expanding the MFT to add detailed breakdown to specific sectors.

Adding new explanatory variables that are treated as exogenous may not create additional simultaneity to the model, but they may not necessarily improve projection accuracy. In general, the good practice is to add these variables under the "Assumptions" at the bottom of the **"GDP & Prices"** sheet and set their values during the projection year based on assumptions or exogenous process. If these variables are calculated based on equations that include endogenous variables, users will need to be mindful of creating circularities, which will need to be resolved by creating an additional Goal Seek.

ANNEX 1. Macroeconomic Identities and the MFT Equations

This annex summarizes the standard macroeconomic identities and discusses the properties and operationalization of the MFT behavioral equations.

Macroeconomic identities

The fundamental identity driving the tool is the standard national accounts identity and the GDP by expenditure, which links the main sectors of the economy and derives the S-I balances.

$$GDP = Private\ Demand + Public\ Demand + Net\ Exports,$$

where

$$Public\ Demand\ (D\ pub) = Government\ Consumption\ (Cg) + Governmnet\ Investment(Ig).$$

$$Private\ Demand\ (D\ priv) = Private\ Consumption(Cp) + Private\ Investment(Ip).$$

$$Net\ Exports = exports\ of\ nonfactor\ goods\ and\ services\ (X) - imports\ of\ nonfactor\ goods\ and\ services\ (M).$$

Reformulating the equation:

$$GDP = Cg + Ig + Cp + Ip + X - M.$$

Regrouping consumption and investment terms:

$$GDP = (Cg + Cp) + (Ig + Ip) + X - M.$$

Adding factor income from goods and services ($Gf + Sf$) and other transfers (Ot) to both sides of the equation:

$$(Gf + Sf + Ot) + GDP = (Cg + Cp) + (Ig + Ip) + X - M + (Gf + Sf + Ot). \quad (1)$$

The left-hand side of the equation denotes Gross National Disposable Income (GNDI):

$$GNDI = (Gf + Sf + Ot) + GDP.$$

Rearranging to subtract consumption and investment from the left-hand side in equation (1) yields

$$GNDI - (Cg + Cp) - (Ig + Ip) = X - M + (Gf + Sf + Ot),$$

where $GNDI - (Cg + Cp)$ denotes National Savings, Sn, such that

$$Sn - (Ig + Ip) = X - M + (Gf + Sf + Ot).$$

And with the right-hand side of the equation denoting the current account balance, CAB:

$$CAB = X - M + (Gf + Sf + Ot).$$

The derivation of the (public and private) Saving-Investment gap equation concludes, which reflects (drives and explains) the current account balance:

$$Sn - (Ig + Ip) = CAB.$$

Another fundamental equation is the standard Income Velocity of Money Equation in line with the quantity theory of money:

$$M * V = P * Q.$$

M denotes Money supply, *V* the rate of spending (income velocity of money), and *P* and *Q* the price and quantities of goods and services, respectively, proxied by GDP. The equation projects monetary aggregates in line with projected inflation, real GDP growth, and assumptions on money velocity.

Short- and long-term elasticities in the MFT equations[12]

Users can modify the MFT equations to reflect country-specific needs or circumstances, and they should pay attention to the coefficients that reflect elasticities and relationships among variables. This section discusses the properties of the MFT equations, particularly the short- and long-term elasticities that determine the long-term convergence and relationships among variables.

The MFT behavioral equations could be written in a generic form as follows:

$$\dot{y}_t = \rho\, \dot{y}_{t-1} + (1 - \rho)\alpha\, \dot{x}_t + \varepsilon_t.$$

There are few noteworthy facts about this specification:

- One-off shock ε_t to $\dot{y}_t$ permanently increases the level of y_t, without changing the level of x_t and thus permanently moves to a new share of x/y. Therefore, it is important to monitor the levels of the variables over the projection horizon. This is the trade-off between maintaining simplicity and anchoring to a steady-state equilibrium of the model.
- This specification embeds a homogeneity assumption that in the long term, with $\varepsilon_t = 0$, the behavior between $\dot{y}_t$ and $\dot{x}_t$ is as follows: $\dot{y}_t = \alpha\, \dot{x}_t$. This means that in the long term, the variable y_t is growing faster than x_t by a factor of α and in levels, their implied ratio is ever increasing.
- For both variables to grow at the same rate and to stabilize their ratio, it must be that $\alpha = 1$, although a shock on ε_t could still lead to a permanent change of x/y.

The limitation of the unitary elasticity to stabilize the ratio between the two variables, if desirable, does not allow for the capture of real-world behavior of many variables, where on average they have a stable ratio but one of the variables is much more volatile in deviation from the trend. A good example would be the relationship between output and investment.

One possible specification to allow the variables to grow at the same rate in the long term while having a short-term larger sensitivity is to specify the variables in deviation from their long-term growth rates:

$$\dot{y}_t - g_y = \rho(\dot{y}_{t-1} - g_y) + (1 - \rho)\alpha_{sr}\left(\dot{x}_t - g_x\right) + \varepsilon_t.$$

[12] This section is prepared by Michal Andrle (ICDMF).

In this case, when $\rho < 1$, we have $\dot{y}_t - g_y = \alpha_{sr}(\dot{x}_t - g_x)$, which implies that $\dot{y}_t = g_y$ and $\dot{x}_t = g_x$. Equivalently, factoring the constant terms outside the parenthesis, we have

$$\dot{y}_t = \left(g_y - \rho g_y - (1-\rho)\alpha_{sr} g_x\right) + \rho\, \dot{y}_{t-1} + (1-\rho)\alpha_{sr}\, \dot{x}_t + \varepsilon_t.$$

This illustrates why running a purely reduced-form econometric estimation of the form $\dot{y}_t = c + \beta_1\, \dot{y}_{t-1} + \beta_2\, \dot{x}_t + \eta$ could result in a meaningful (and negative) constant and a large β_2 coefficient on $\dot{x}_t$. Without an explicit set of restrictions, however, the model would not have the long-term properties desired.

This extended specification allows for unitary elasticity between the variables in the long term while non-unitary elasticity in the short term. The property of shocks leading to permanent change of the ratio between the variables is, however, unremedied. The solution to this property would be an explicit trend-and-gap specification or using an error correction term as used in other macroframework projection tools such as the QMFF or CAEM.

Projection formulas in the MFT template

The MFT relies on behavioral equations (presented in Chapter II) and government expenditures to generate projections for real GDP components and inflation. Because the MFT could be modified to address country-specific needs and data availability, users have flexibility to operationalize the MFT equations by generating specific formula in the Excel file for practical use. In the standard MFT template, the formula and calculations for generating projections are operationalized as follows:

$$\textbf{Private consumption: } \%\Delta\, Cp_{(t)} = \alpha_1 * \left[\%\Delta\, Cp_{(t-1)}\right] + \alpha_2 * \left[\%\Delta\, Private\ RGNDI_{(t)}\right] +$$

$$\alpha_3 * \Delta\, Real\ effective\ lending\ rate_{(t)},$$

where *Private RGNDI* (Private Real Gross National Disposable Income) equals *RGNDI* by excluding taxes minus transfers, and real effective lending rate equals to effective lending rate deflated by CPI inflation. More specifically,

$$RGNDI_{(t)} = RGNDI_{(t-1)} * \left[1 + \%\Delta\, RGNDI_{(t)}\right],$$

$$\%\Delta\, RGNDI_{(t)} = \frac{GDP}{GNDI} * \left[\%\Delta\, RGDP_{(t)}\right] + \left[1 - \frac{GDP}{GNDI}\right] * \left[\frac{\left(1 + \%\Delta\, (PrimI + ScdrI)_{(t)}\right)}{\left(1 + \%\Delta\, Foreign\ CPI_{(t)}\right)} - 1\right],$$

with *PrimI* and *ScdrI* denoting primary and secondary income from abroad.

Public consumption, *Cg*, grows in line with the growth in noninterest expense from the fiscal accounts, deflated by consumption deflator, which is linked to the Consumer Price Index (CPI).

$$\%\Delta\, Cg_{(t)} = \left[\frac{1 + \%\Delta\, Non\ interest\ expense_{(t)}}{1 + \%\Delta\, Consumption\ deflator_{(t)}}\right] - 1.$$

Private investment: $\%\Delta\, Ip_{(t)} = \beta_1 * \left[\%\Delta\, RGDP_{(t)} - \%\Delta\, RGDP_{(t-1)}\right] + \beta_2 * \left[\%\Delta\, Potential\ GDP_{(t)}\right] +$

$$\beta_3 * \Delta\, Real\ effective\ lending\ rate_{(t)}.$$

The MFT relies on an exogenous estimate of potential GDP, which is used to gauge the current and projected stance of the economy in the business cycle, calculate cyclically adjusted indicators, and feed the inflation equation.

Public investment, *Ig*, grows in line with the growth of public investment spending from the fiscal accounts, deflated by Gross Fixed Capital Formation deflator, which is calculated as an average of the consumption and import deflators.

$$\%\Delta\, Ig_{(t)} = \left[\frac{1 + \%\Delta\, Public\ investment\ spending_{(t)}}{1 + \%\Delta\, GFCF\ deflator_{(t)}}\right] - 1.$$

Exports of goods and services, *X*, are projected to grow in line with a measure of foreign demand, adjusted for exchange rate effects.

$$\%\Delta\, X_{(t)} = \gamma_1 * [\%\Delta\, Partner\ non\ oil\ imports_{(t)}] + \gamma_2 * [\%\Delta\, REER_{(t)}].$$

Imports of goods and services, *M*, are projected to grow in line with a measure of domestic demand, adjusted for exchange rate effects.

$$\%\Delta\, M_{(t)} = \delta_1 * [\%\Delta\, RGDP_{(t)}] + \delta_2 * [\%\Delta\, REER_{(t)}].$$

CPI inflation is projected in line with the lagged inflation, inflation target, estimated output gap, and import prices:

$$\%\Delta\, CPI_{(t)} = \theta_1 * [\%\Delta\, CPI_{(t-1)}] + (1 - \theta_1) * [\%\Delta\, CPI\ Target_{(t)}] + \theta_2 * [Output\ gap_{(t)}] + \theta_3 * [\%\Delta\, Import\ price_{(t)} - \%\Delta\, Import\ price\ at\ steady\ state].$$

Deflator for exports, *X deflator*, is projected in line with the respective shares of oil and non-oil exports in total trade in goods and services combined with partners' oil and non-oil price deflators, and exchange rate effects.

$$\%\Delta\, X\ deflator_{(t)} = [1 - oil\ X\ share_{(t)}] * ([1 + \%\Delta\, Partner\ oil\ X\ deflator_{(t)}] * [1 + \%\Delta\, Exchange\ rate_{(t)}] - 1) + [oil\ X\ share_{(t)}] * ([1 + APSP_{(t)}] * [1 + \%\Delta\, Exchange\ rate_{(t)}] - 1).$$

Deflator for imports, *M deflator*, is projected in line with the respective shares of oil and non-oil imports in total trade in goods and services combined with partners' oil and non-oil price deflators, and exchange rate effects.

$$\%\Delta\, M\ deflator_{(t)} = [1 - oil\ M\ share_{(t)}] * ([1 + \%\Delta\, Partner\ oil\ X\ deflator_{(t)}] * [1 + \%\Delta\, Exchange\ rate_{(t)}] - 1) + [oil\ M\ share_{(t)}] * ([1 + \%\Delta\, APSP_{(t)}] * [1 + \%\Delta\, Exchange\ rate_{(t)}] - 1),$$

where *APSP* is the Average Petroleum Spot Price.

Taylor Rule: The MFT has a simple rule to estimate interest rates as a function of an interest rate gap (the deviation of inflation expectations from the monetary authorities' inflation target) and the output gap (over or underheating in economic activity), augmented by an estimate of the equilibrium interest rate.

$$Tailor\ Rule = Inflation\ expectations + Equilibrium\ interest\ rate + \alpha * [inflation\ expectations - inflation\ target] + \beta * [output\ gap].$$

ANNEX 2. Modifying the Structure of the MFT: Examples

Two examples are provided in this section to outline in detail how the MFT can be further modified.

Example 1. Detailed breakdown of the fiscal sector

The MFT could be modified to incorporate a detailed breakdown of tax revenues and expenditure items in the budget.

(a) ***Projecting detailed tax or nontax items:*** such as separate projections for taxes on corporate income (profits), taxes on individual income (on private or public salaries from employment), taxes on consumption (goods and services), taxes on international trade (customs duties), or other nontax revenues. The basic idea is to split the revenue components in the fiscal sector to capture these details and then project each revenue component separately to add up to the total projection for revenue.

To modify the MFT:

- In the "Source Data" sheet, create new rows as needed for each (or any) of these tax types under the section "Government Accounts, current prices." Then, input the relevant historical actual data for each series from official data (MoF).
- In the "Policies & Assumptions" sheet, create new rows under "Tax revenue" for the same new tax item(s), and link historic data in this sheet to corresponding years in the "Source Data" sheet.
- To project each of these tax types, an appropriate tax base will need to be identified (for example, final consumption used for taxes on goods and services, or value of commodity imports for taxes on international trade).
- Input (populate) the identified relevant tax base to be used to project the tax item in the "Source Data" sheet.
- In the "Policies & Assumptions" sheet, create new rows as needed for each (or any) new tax base, then link it to the corresponding years in the "Source Data" sheet. Project the identified tax base and use it to arrive at projections for the relevant tax items. Repeat this for other tax types.
- Ensure that data in the newly added items (rows) sum to total tax revenue. Modify the formula for "Tax revenue" as needed to capture the level of details added.
- Shares of newly added tax items to GDP can be calculated and added as newly created rows in the "Policies & Assumptions" sheet under "in percent of GDP."
- Expand the "SEI" sheet to reflect additional rows (new added series) under the section "Fiscal position," as needed.

(b) ***Projecting detailed noninterest expenditure (current or capital spending):*** such as by category, for example, wages and salaries; purchases of goods and services; subsidies, grants, social benefits, or other transfers; and a greater detail of the capital budget. The basic idea is to split the expenditure components in the fiscal sector to capture these details and then project each expenditure component separately to sum to the total projection for expenditure.

To modify the MFT:

- A similar methodology used to modify the MFT in the case of a detailed breakdown of tax revenue items can be replicated here for detailed expenditures.

- In the "Source Data" sheet, create new rows as needed for each (or any) of these spending types under the section "Government Accounts, current prices." Then, input the relevant historical actual data for each series from official data (MoF).
- In the "Policies & Assumptions" sheet, create new rows under "Noninterest Expenses" for the same new spending item, and link historic data in this sheet to corresponding years in the "Source Data" sheet.
- To project each of these spending types, an appropriate expenditure base will need to be identified (for example, number of employees for the public wage bill and average wages, GDP and Incremental capital-output ratio for investment spending, and so on).
- Input (populate) the identified relevant expenditure base to be used to project the spending item in the "Source Data" sheet.
- In the "Policies & Assumptions" sheet, create new rows as needed for each (or any) new expenditure base, then link it to the corresponding years in the "Source Data" sheet. Project the identified expenditure base and use it to arrive at projections for the relevant spending item. Repeat this for other spending types.
- Ensure that data in the newly added items (rows) sum up to total "Noninterest Expenses." Modify the formula as needed to capture the level of details added.
- Shares of newly added spending items to GDP can be calculated and added as newly created rows in the "Policies & Assumptions" sheet under "in percent of GDP."
- Expand the sheet "SEI" to reflect additional rows (new added series) under the section "Fiscal position," as needed.

Example 2. Detailed breakdown of the real, external, and fiscal sectors: Case of an oil exporter

The authorities may request a further breakdown of the GDP, BOP, and fiscal sector projections in the MFT in a country that is oil dependent, where oil production and exports play a central role and have a significant impact on the macroeconomic framework. As such, a detailed recalibration of the projections for all three sectors—centered on the hydrocarbons sector—would be advised.

(a) ***Projecting a real sector centered on oil production:*** projecting GDP composition according to its breakdown into oil and non-oil sectors may be needed. The basic idea is to split exports of goods and services in the GDP into three export components: oil, non-oil, and services. Then, project these three components separately, and feed the projections into the real, external, and fiscal sectors in the economy.

To modify the MFT:

- In the "Source Data" sheet, create new rows for oil and non-oil production, under the section "National Accounts—Production, constant prices."
- Provided that data are also available for these series in nominal terms, create a new section called "National Accounts—Production, current prices" and new series for total GDP, oil, and non-oil GDP. Then, input the relevant historical actual data for each series from official data.
- In the "Source Data" sheet, create new rows for oil and non-oil commodity exports, under the section "National Accounts—Production, constant prices," under the series "Exports of Goods and Services." Provided that data are also available for these series in nominal terms, create similar rows under the newly created "National Accounts—Production, current prices." Populate the historic data in the new rows from official data.
- In the "Source Data" sheet, also create a new section "Oil sector," and create new rows for "domestic consumption of oil," and for "export of oil" in volume (real) terms. Then, input the relevant historical actual data for each series from official data.

- In the "GDP & Prices" sheet, under the section "Real Output By Sector," create new rows for oil and non-oil sector output. Then, link historic data in this sheet to corresponding years in the "Source Data" sheet. Project oil output in line with local production capacity or share in world production, global demand or demand from key partners, and so on. Project non-oil GDP as a residual from total GDP (from the expenditure side approach) and oil output, and check realism of the projections.
- In the "GDP & Prices" sheet, under the section "Assumptions," create a new row for "domestic consumption of oil," and link historical annual data to the same series in the "Source Data" sheet. Project consumption of oil as a residual from total oil output and oil export volume. In some countries, domestic consumption of oil is computed as a residual after also taking account of domestic oil reserve buffers, where these are sizable. Judgment is to be used to ensure realism and consistency in projections between oil production (output), oil exports, and oil consumption series.
- In the "GDP & Prices" sheet, under the section "Real Expenditure," under the series "Exports of G&S, constant prices," add rows to split this series into "commodity" and "service" exports, with a further breakdown of "commodity exports" into "oil exports" and "non-oil" exports. Then, link historic data for oil and non-oil export volume in this sheet to corresponding years in the sheet "Source Data."
- In the "GDP & Prices" sheet, project "oil" export volume in line with partner demand, the REER, and local production of oil. Then, project "non-oil" exports and "service" exports in line with the import demand function (partner imports and the REER).
- In the "GDP & Prices" sheet, under the section "Deflators," create three new rows to compute separate deflators for: (1) oil exports (using the oil price and oil export share in commodity exports), (2) "non-oil" exports, and (3) "services" (using the exchange rate, partner's non-oil export deflators).
- In the "Deficits & Financing" sheet under "Nominal GDP and National Income," create new rows under the series "Exports of G&S, LC, current prices" to project nominal values for oil exports and non-oil exports (summing both to commodity exports), and then project services, using the respective deflators and real (volume) of these variables that were projected in the sheet "GDP & Prices." Modify the formula for "Exports of G&S, LC, current prices" by adding up the projected series for commodity and service exports in nominal terms.
- Expand the sheet "SEI" to reflect additional rows for the oil sector (new added series) under the sections "Real GDP growth and the business cycle," "Production," and "Real expenditure growth" (under "exports of goods and services"), as needed.
- In the "GDP & Prices" sheet, ensure consistency of projected GDP in constant prices between production and expenditure approaches.

(b) ***Projecting details in the external sector to capture oil exports dynamics more explicitly:*** while no modification is required for the external sector given that the flow (causality) from the GDP to BOP as a result of the oil sector focus has not altered aggregate linkages across the sectors, users can still show a more detailed breakdown of commodity exports into oil and non-oil receipts for analytical purpose in the BOP.

To modify the MFT:

- In the "Deficits & Financing" sheet under the section "Balance of Payments," under the series "Goods & services balance," create new rows to reflect the commodity and services balances separately, with a further split of the commodity balance into exports and imports, and a further breakdown of exports into oil and non-oil exports. These rows are easily linked to the rows previously created in the same sheet under the section "Nominal GDP and National Income," under the title "Exports of G&S, LC, current prices," with a conversion into foreign currency terms using the exchange rate.

- If required for analytical purposes, the overall commodity (trade) balance can also be split further by creating two rows to show the "commodity oil" and "commodity non-oil" balances, provided sufficient information on oil imports is readily available to the authorities or can be estimated.
- Expand the "SEI" sheet to reflect additional rows for the oil sector (new added series) under the section "External position," as needed.

(c) ***Projecting a detailed Fiscal sector centered on government oil receipts:*** The breakdown of tax and nontax revenues into oil and nonoil-related revenue streams would be more suitable for projection purposes.

To modify the MFT:

- In the "Source Data" sheet, create new rows as needed for oil revenue (tax and nontax), under "Government Accounts, current prices," and populate historic annual series using official data.
- In the "Policies & Assumptions" sheet, create new rows under "Government Budget" section, under "tax revenue" and "nontax revenue" to show oil-related receipts (tax and nontax). Then, link historic data in this sheet to corresponding years in the "Source Data" sheet. Calculate non-oil "tax" receipts as a residual from total tax revenue and oil-tax receipts. Calculate non-oil "nontax" receipts as a residual from total nontax revenue and nontax oil receipts.
- In the "Policies & Assumptions" sheet, project oil-related tax receipts in line with the projected value of oil exports from the Real sector, or, alternatively, from the external (BOP) sector, while factoring in the impact of the exchange rate. Consider specific contractual details, formulas, or other legal requirements to calculate the tax to be collected by the government in line with existing regulations. As a cross-check, calculate a historic effective tax rate (for example, divide actual tax receipts in fiscal by the value of oil export receipts from Real, or from BOP adjusted using the exchange rate) and compare this rate to the one obtained from projections.
- In the "Policies & Assumptions" sheet, repeat a similar methodology to project oil-related nontax receipts.
- In the "Policies & Assumptions" sheet, project "non-oil" taxes and "non-oil" nontax revenue. Modify the projection formula for "Tax revenue" to capture both oil and non-oil tax revenue lines. Modify the projection formula for "Nontax revenue" to capture both oil and non-oil revenue lines.
- Shares of newly added line items (oil and non-oil, tax and nontax) to GDP can be calculated and added as newly created rows in the "Policies & Assumptions" sheet, under "in percent of GDP."
- Expand the "SEI" sheet to reflect the breakdown rows (new added series) under the section "Fiscal position," as needed.

Notes on output gap approach in an oil-dependent economy

Users need to exercise judgment and caution on the realism of fiscal sector analysis based on the cyclically adjusted fiscal balances calculated using the standard output gap estimates in the case of an oil-dependent economy. Because the oil sector plays a large role in the economy, using the standard oil and non-oil fiscal balances for policy purposes is considered more appropriate. An analytical approach based on the standard Permanent Income Hypothesis is also useful to assess the risk of fiscal/debt and external sustainability as oil wealth depletes over time and its implications for fiscal and macro policy design. In addition, commodity price shocks often hamper the effectiveness of monetary policy operation in an oil-dependent economy with a flexible exchange rate regime and an inflation target. In this case, the MFT's reliance on the standard output gap estimates that feed into the Taylor Rule and other variables for projection purposes and policy inference will also need to be reviewed.

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