

The Integrated Economic-Environmental Modeling Platform (IEEM)

IEEM Platform Technical Guides: User Guide

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Environment, Rural
Development and Risk
Management Division

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The Integrated Economic-Environmental Modeling Platform (IEEM)
IEEM Platform Technical Guides: User Guide

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Abstract

This Technical Guide is the User Guide for the Integrated Economic-Environmental Modeling (IEEM) Platform, a recursive dynamic computable general equilibrium model developed at the Inter-American Development Bank for medium and long-run public policy and investment analysis. The IEEM Platform pays special attention to the modeling of the interaction between the economy and the environment through its integration of data organized under the System of Environmental-Economic Accounting. This document describes how to implement the General Algebraic Modeling System (GAMS) code of the IEEM Platform.

JEL Codes: D58 Computable and Other Applied General Equilibrium Models; Q56 Environment and Development • Environment and Trade • Sustainability • Environmental Accounts and Accounting • Environmental Equity • Population Growth.

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1. Introduction

In this Technical Guide we describe how to implement the General Algebraic Modeling System (GAMS) code of the Integrated Economic-Environmental Modeling (IEEM) Platform. IEEM is an environmentally-extended recursive dynamic computable general equilibrium (CGE) model developed at the Inter-American Development Bank for medium and long-run public policy and investment analysis. The IEEM Platform pays special attention to the modeling of the interaction between the economy and the environment, through its integration of data organized under the System of Environmental-Economic Accounting (United Nations, European Commission et al. 2014).

The IEEM Platform is described and applied in various publications including (Banerjee, Cicowiez et al. 2016, Banerjee, Cicowiez et al. 2019, Banerjee, Cicowiez et al. 2019, Banerjee, Bagstad et al. In press). Companion to this User Guide is a detailed mathematical model statement (Banerjee and Cicowiez 2019) and a step-by-step description on the construction of an IEEM database (Banerjee, Cicowiez et al. 2019). The implementation of the IEEM Platform and analysis of results is facilitated by the ISIM interface (Cicowiez, Consigli et al. 2018), though it is not required as IEEM may be implemented directly in GAMS.

2. GAMS Code Organization

The IEEM Platform was developed as a “standard” model, meaning that the same model can be implemented using various datasets for different countries. In other words, the “theory” of the model is completely separated from the data that is used for model calibration. In fact, certain characteristics of IEEM (e.g., the tracking of CO₂ emissions) can be active or not depending on the dataset set that is used to make the model operational.

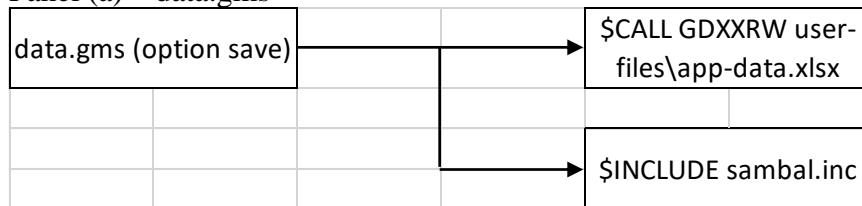
In figure 1 we show how the GAMS files of the model are organized. As can be seen, we use a modular approach where some parts of the code are re-utilized. The GAMS model code is organized around four main files: data.gms, mod.gms, sim.gms, and rep.gms. The files data.gms and mod.gms define and calibrate the model, replicating the information in the social accounting matrix (SAM) and satellite environmental accounts in order to verify the consistency between data and model, and generate the (dynamic) reference scenario. The data that is used for this first step is saved in an Excel file, typically named

app-data.xlsx where app represents the name of the IEEM application (e.g., gtm2010-data.xlsx). The file sim.gms runs the user-defined simulation scenarios. The definition of the simulation scenarios is made using another Excel file, typically named app-sim.xlsx (e.g., gtm2010-sim.xlsx). Finally, the file rep.gms generates several of the report parameters that show up, at the end of model execution, in the file report.gdx, which can be inspected using the GAMSIDE or the ISIM’s own GDX viewer. In what follows, the scenario that results from running mod.gms is called “reference scenario”. In turn, sim.gms runs the “base scenario”, which usually will be the same as the reference scenario. However, below we explain the reasons for making such a distinction between the reference and the base scenarios.

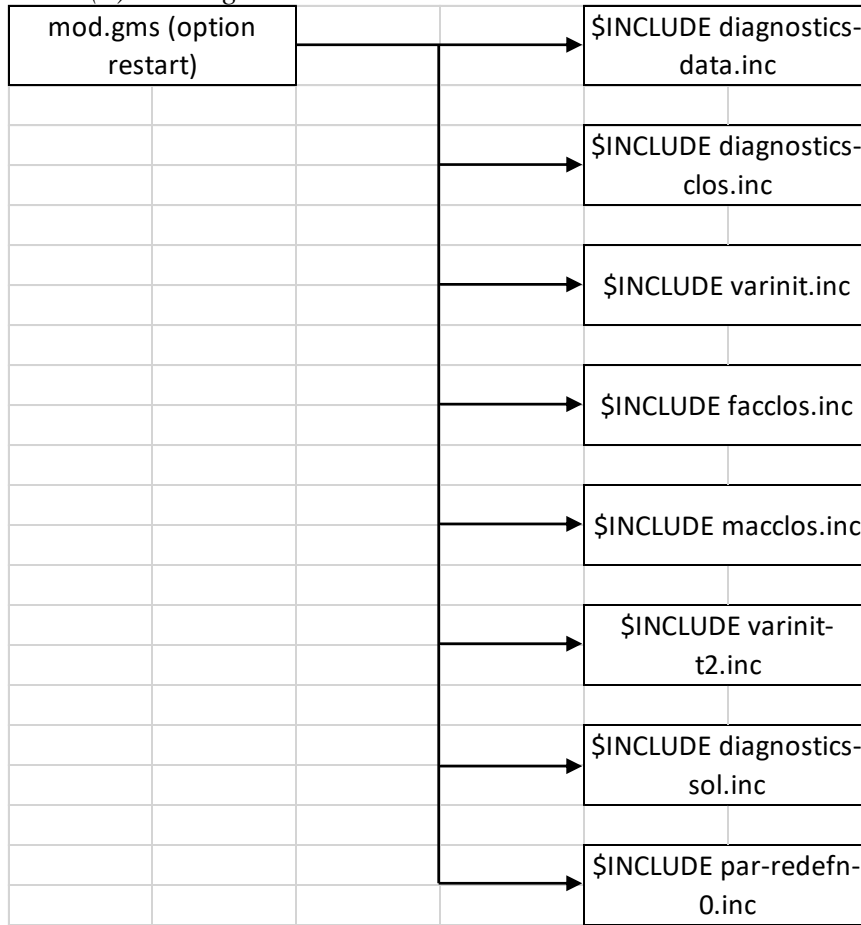
When IEEM is run through the ISIM interface, the software takes care of running the three GAMS files mentioned in the previous paragraph. Thus, when using ISIM, the user does not need to worry about knowing the GAMS modeling language.

Figure 1. Organization of GAMS files for IEEM CGE model.

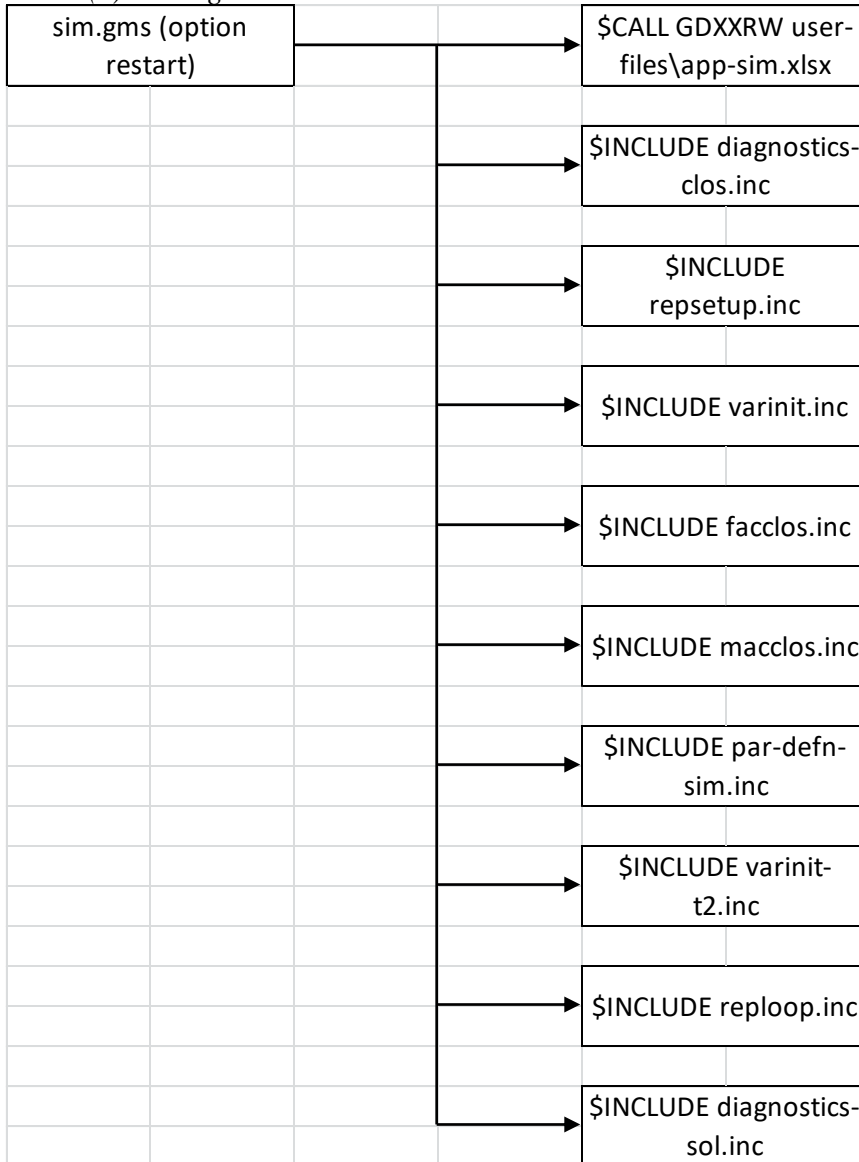
Panel (a) – data.gms



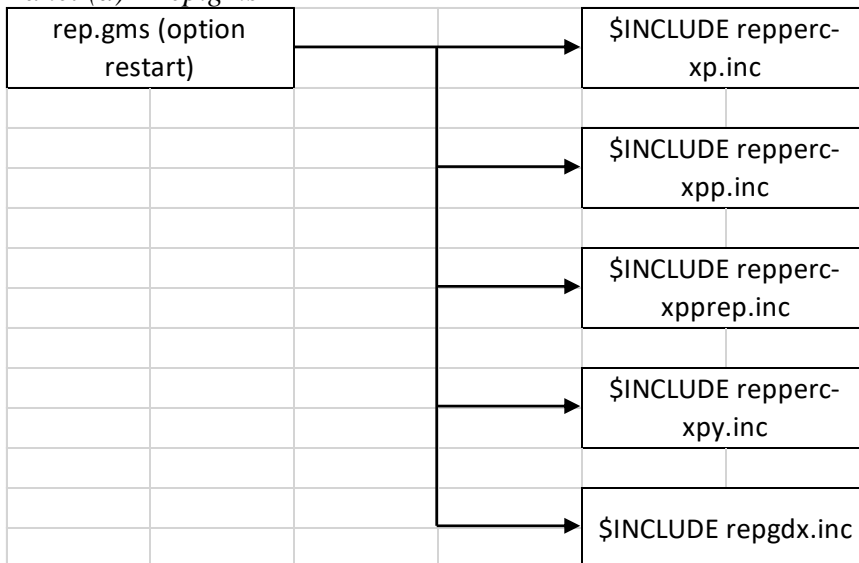
Panel (b) – mod.gms



Panel (c) – sim.gms



Panel (d) – rep.gms

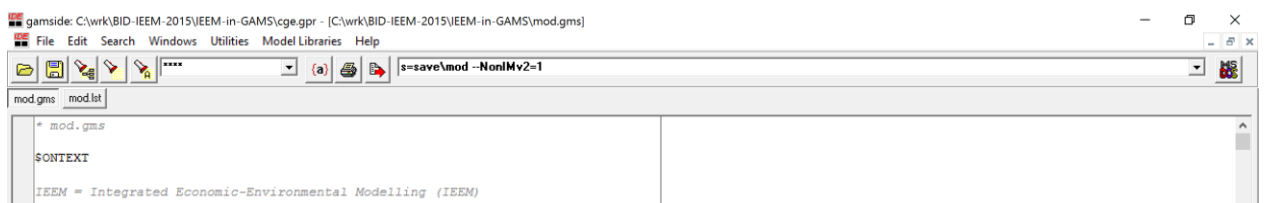


The installation of IEEM implies unzipping the distributed file (generally, IEEM-in-GAMS-yyyy-mm-dd.zip) in a dedicated folder. As was described, the following seven files should be executed sequentially in order to run IEEM model:

- **data.gms** with the command line option `s=save\data --NonIMv2=1`
- **mod.gms** with the command line option `r=save\data s=save/mod`
- **sim.gms** with the command line option `r=save/mod s=save/sim`
- **rep.gms** with the command line option `r=save/sim s=save/rep`
- **repbasyr.gms** with the command line option `r=save/rep s=save/repbasyr`
- **repmacro.gms** with the command line option `r=save/repbasyr s=save/repmacro`
- **repmeso.gms** with the command line option `r=save/repmacro s=save/repmeso`
- **repenviro.gms** with the command line option `r=save/repmeso s=save/repenviro`
- **reppov.gms** with the command line option `r=save/repenviro s=save/reppov`

As an example, figure 2 shows how the GAMSIDE window should look when running mod.gms. The workings of the GAMS interface is described in [Help | docs | tools | gamside.pdf](#). As explained, the steps described are not needed when the model is run through ISIM.¹ In addition, note that the command line option `--NonIMv2=1` used when running mod.gms indicates that the model is not being run through ISIM.

Figure 2. Execution of mod.gms.



¹ In the document “Instructions to Add the IEEM CGE Model to ISIM” the steps required to add the IEEM model to ISIM are explained in detail.

3. Steps to Implement the IEEM in GAMS

In this section, the steps required to implement IEEM with a new dataset are described. Generally, we recommend saving the files created by the user in the folder “user-files”.

In the most common case, the next steps should be followed:

- i) create copies of the files demo-data.xlsx and demo-sim.xlsx that are located in the user-files folder;
- ii) rename the file copies made in the previous step to something like arg2012-data.xlsx and arg2012-sim.xlsx, where arg2012 refers to the name that is given to the new application of IEEM;
- iii) in the file mod.gms, add the sentence \$SET app2 arg2012 where it is indicated.

In our case, the distributed model contains, besides the two example datasets (i.e., demo and demo2), another with the data for Guatemala with 2010 as its base year.

In case of using the model through ISIM, see (Cicowiez, Consigli et al. 2018). Specifically, see the section that explains how to add a new dataset to an existing model in ISIM.

4. Data File

In this section we describe the content of each of the sheets in the Excel that contains the information used to calibrate the model. As section titles, we used the name of each Excel sheet together with the name of the parameter that defines, identifying its set dimensions.

dmod – dmod

Type: parameter

Domain: n.a.

Model Variant: all

Units: 0,1,2,3

Mandatory: yes

Description: selects the version of the model that will be used. The valid values are

- **dmod=0** to use the model in “static mode”; in this case, the shocks to be simulated should be introduced for the first year in the set t (see below).

- **dmod=1** to use the dynamic version of the model under the assumption that the baseline generation is conducted by imposing an exogenous rate of GDP growth, at the same time that total factor productivity is considered an endogenous variable. Besides, the user can specify growth rates and/or GDP shares for other exogenous variables such as labor supply, land supply, government consumption, among others. It is worth mentioning that for the simulation scenarios the rate of GDP growth is always endogenous.
- **dmod=2** to use the dynamic version of the model assuming that the reference scenario is generated under the assumption that the modeled economy is on a balanced growth path; in this case, the growth rate specified in the sheet/parameter sgrw (see below) is applied to all quantities in the model, at the same time that relative prices stayed unchanged.
- **dmod=3** to use the dynamic version of the model under the assumption that the baseline generation is conducted by imposing an exogenous rate of TFP growth, at the same time that GDP is considered an endogenous variable. Besides, the user can specify growth rates and/or GDP shares as when dmod=1.

time-related-sets

Type: sets

Domain: t

Model Variant: static (only base-year) and dynamic

Units: n.a.

Mandatory: yes

Description: In the dynamic variant of the model, sets t and tsol(t) are used (see table 1). The set t refers to all periods for which the model can (potentially) be solved. In turn, set tsol(t) contains the periods for which the model is actually solved. For example, when designing the scenarios the analyst can run the model for only a few periods using tsol(t) with the aim of speeding up the debugging process.

Table 1. Time sets.

set	description
t	all periods
tsol(t)	solution periods
trep(t)	selected report periods
tminrep(t)	first report period
tmaxrep(t)	last report period
tpovdata(t)	year for poverty data

global-set

Type: set

Domain: n.a.

Model Variant: all

Units: n.a.

Mandatory: varies across sets

Description: the set ac contains all the accounts in the social accounting matrix, together with additional elements such as reserved keywords that are used to make reference to government consumption (i.e., congov), products not in the SAM but that are defined through the mapaggreg mapping (see below), among others.

sam-related-sets

Type: sets

Domain: varies across sets

Model Variant: all

Units: n.a.

Mandatory: varies across sets

Description: Table 2 shows the list of sets that are defined in the Excel data file used for model calibration. The remaining model sets are automatically defined in the GAMS model code. The x(y) notation implies that set x is a subset of set y, meaning that all elements of set x should also be elements of set y. It is relevant to note the presence of set r(ac), which contains the trade partners of the modeled country identified in the SAM. In this model we have minimized the number of mandatory names for SAM accounts. For

example, the name of the SAM account that refers to direct taxes can be chosen arbitrarily, provided it complies with GAMS restrictions for set elements. Then, that name should be introduced in the set `taxdir(itax)`. On the other hand, an account named “total” is mandatory, as it is explicitly referenced (i.e., it is hard-coded) in the GAMS model code (see file `mod.gms`).

Table 2. Sets for reading the SAM.

set	descripción
ac	global set (SAM accounts and other items)
a(ac)	activities
acro(a)	activities crops
aliv(a)	activities livestock
afor(a)	activities forestry
afsh(a)	activities fishing
amin(a)	activities mining
aele(a)	activities electricity
aelegen(aele)	activities electricity generation
c(ac)	commodities
cwat(c)	commodities water
c1(c)	commodities at level 1 of utility fn
c2(c)	commodities at level 2 of utility fn
tacd(ac)	domestic trade and transport margin account
tacm(ac)	import trade and transport margin account
tace(ac)	export trade and transport margin account
f(ac)	factors
flab(f)	factors labor
fcap(f)	factors capital
fcapng(fcap)	factors capital government
fcapg(fcap)	factors capital non-government
fland(f)	factors land
ffor(f)	factors productive forest land (forest plantations)
fwat(f)	factors water
fleo(f)	factors with fixed coefficient relation to output
ins(ac)	institutions
insd(ins)	domestic institutions
insdng(insd)	domestic non-government institutions
h(insdng)	households
hrur(h)	households urban
hurb(h)	households rural
e(insdng)	enterprises
insngo(insdng)	non-gov organizations and npish
inssec(insdng)	social security inst
insrow(ins)	rest of the world
instrst(ac)	foreign tourists
actax(ac)	all taxes
taxvatc(actax)	value-added tax
taxcom(actax)	sales tax
taxact(actax)	tax on producer gross output value
taxdir(actax)	direct tax on dom inst ins
taximp(actax)	import tariff
taxexp(actax)	export tax
taxfact(actax)	tax on factor use (alt soc sec tax)
taxfac(actax)	direct tax on factors (soc sec tax)
taxco2(actax)	tax on CO2 emissions
subcom(ac)	commodity demand subsidies
inv(ac)	investment accounts
invng(inv)	non-government investment
invg(inv)	government investment
dstk(ac)	changes in inventories
r(ac)	trade partners
capins(ac)	capital accounts inst
capinsd(capins)	capital accounts insd
capinsdng(capinsd)	capital accounts insdng
acrep	user-defined aggregated accounts used in selected reports

sam – SAM(ac,acp)

Type: parameter

Domain: ac,acp

Model Variant: all

Units: monetary

Mandatory: yes

Description: social accounting matrix that will be used to calibrate the model is stored. Generally speaking, it is advisable that no large differences exist between the maximum and the minimum values in the SAM. In addition, it is preferable that values in the SAM do not exceed the number 99999. Doing this, the SOLVE performance when searching for a model solution is improved. To that end, the sheet "scaling" can be used to re-scale the SAM (see below), if necessary.

emibase – emibase(ghg,ac,acp)

Type: parameter

Domain: ghg,ac,acp

Model Variant: all

Units: physical

Mandatory: no

Description: data on emissions, by pollutant ghg, commodity ac, and polluter acp.

watbase -- watbase(ac,acp)

Type: parameter

Domain: ac,acp

Model Variant: all

Units: physical

Mandatory: no

Description: data on water use by activities and households. In addition, note that water can be disaggregated between various types; e.g., potable water provided by the water

company, and non-registered water provided by the environment. Of course, the water input for the water company is sourced from the environment. For the case of Guatemala, we provide a GAMS code that processes and aggregates the original supply and use table and environmental data so that it can be used to calibrate our IEEM CGE model. To facilitate the workings of the reporting system, we recommend using cubic meters as units. For an example, see figure 3.

Figure 3. Example watbase.

watbase(ac,acp)	water (m3)			
	aa-agr	aa-ctl	aa-for	aa-fsh
water-sup-registered				
water-sup-nregistered				
water-use-registered	8,904,872			
water-use-nregistered	21,142,764,815	26,566,248	501,516,456	514,618,007

cen01 – cen01(c)

Type: parameter

Domain: c

Model Variant: all

Units: 0,1

Mandatory: yes

Description: 0-1 parameter used to indicate energy commodities.

cedexog010 -- cedexog010(c)

Type: parameter

Domain: c

Model Variant: all

Units: 0/1

Mandatory: no

Description: selection (option 1) of commodities with exogenous export demand and world price. In this case, commodities that are not exported in the base year can be included in cedexog010.

cddexog010 -- cddexog010(c)

Type: parameter

Domain: c

Model Variant: all

Units: 0/1

Mandatory: no

Description: selection (option 1) of commodities with exogenous domestic sales. In this case, commodities that are not sold domestically in the base year can be included in cddexog010.

aqalexog01 -- aqalexog01(a)

Type: parameter

Domain: 0/1

Model Variant: all

Units: n.a.

Mandatory: no

Description: selection (option 1) of activities with exogenous output; see also qabase. For non-base simulations, it is assumed that activity outputs are always endogenous.

aregpa010 -- aregpa010(a)

Type: parameter

Domain: a

Model Variant: all

Units: 0/1

Mandatory: no

Description: selection (option 1) of activities with activity price regulation. For regulated activities, their price is exogenous.

cregpds010 -- cregpds010(c)

Type: parameter

Domain: c

Model Variant: all

Units: 0/1

Mandatory: no

Description: selection (option 1) of commodities with domestic supply price regulation. For regulated commodities, their price is exogenous.

cregpqs010 -- cregpqs010(c)

Type: parameter

Domain: c

Model Variant: all

Units: 0/1

Mandatory: no

Description: selection (option 1) of commodities with composite supply price regulation. For regulated commodities, their price is exogenous.

cregpqd010 -- cregpqd010(c,d)

Type: parameter

Domain: c,d

Model Variant: all

Units: 0/1

Mandatory: no

Description: selection (option 1) of commodities with composite demand price regulation. For regulated commodities, their price is exogenous.

mapaggreg – mapaggreg(ac,acp)

Type: set

Domain: ac,acp

Model Variant: all

Units: Y/N

Mandatory: no

Description: aggregates accounts of the social accounting matrix. For example, figure 4 shows how the tax-vat account can be excluded from the model by aggregating its content with the tax-com account.

Figure 4. Example mapaggreg.

mapaggreg(ac,acp)	
	tax-com
tax-vat	YES

macacrep – macacrep(ac,acrep)

Type: set

Domain: ac,acrep

Model Variant: all

Units: Y/N

Mandatory: no

Description: mapping between accounts in ac and accounts in acrep used to produce aggregated reports.

mcapins -- mcapins(capins,ins)

Type: set

Domain: capins,ins

Model Variant: all

Units: Y/N

Mandatory: yes

Description: mapping between accounts in capins and accounts in ins; used to link institutional capital and current accounts.

mtfactf -- mtfactf(taxfact,f)

Type: set

Domain: taxfact,f

Model Variant: all

Units: Y/N

Mandatory: no

Description: in case the SAM identifies taxes on factor use, this sheet is used to establish a mapping between accounts in the SAM that refer to taxes on factor use by the activities (see rows in figure 5) and the accounts in the SAM that refer to factors (see columns in figure 5). In other words, this mapping is used to identify which is the tax base for each of the taxes on factor use that exist in the SAM. As shown in Figure 5, YES is used to establish a relation between elements in rows and columns; each tax account can only be related to one factor. As can be seen, this mapping is not needed to implement the IEEM.

Figure 5. Example maptfactf.

mtfactf(taxfact,f)		
	f-calif-for	f-ncalif-for
tax-calif	YES	
tax-ncalif		YES

mfcapinv -- mfcapinv(fcap,inv)

Type: set

Domain: fcap,inv

Model Variant: all

Units: Y/N

Mandatory: yes

Description: SAM accounts that represents capital factors (i.e., elements in the set fcap) are linked to SAM accounts that represents investments. As an example, see figure 6. It is worth mentioning that each investment account can be linked to one capital account. Similarly, each capital account can be linked to one investment account. Note that the user can use the mapping mapaggreg to overcome those restrictions.

Figure 6. Example mfcapinv.

mfcapinv(fcap,invng)		
f-cap	invprv-otr	YES
f-capgenterm-g	invg-genterm	YES
f-capgenhidro-g	invg-genhidro	YES
f-capgenterm-ng	invprv-genterm	YES
f-captrnsele	invg-trnele	YES
f-capgengeoterm-ng	invprv-gengeoterm	YES
f-capdistele	invprv-distele	YES

maprtace -- maprtace(r,tace)

Type: set

Domain: r,tace

Model Variant: all

Units: Y/N

Mandatory: depends on SAM

Description: accounts in the SAM that represent trade partners are linked to accounts in the SAM that represent trade and transport margin applied to bilateral exports. Figure 7 shows the case in which the SAM identifies a unique trade partner (i.e., the rest of the world) as destination for exports of the modeled country.

Figure 7. Example maprtace

maprtace(r,tace)		
row	marg-e	YES

maprtacm -- maprtacm(r,tacm)

Type: set

Domain: r,tacm

Model Variant: all

Units: Y/N

Mandatory: depends on SAM

Description: accounts in the SAM that represent trade partners are linked to accounts in the SAM that represent trade and transport margin applied to bilateral imports. Figure 8

shows the case in which the SAM identifies a unique trade partner (i.e., the rest of the world) as origins for imports of the modeled country.

Figure 8. Example maprtacm.

maprtacm(r,tacm)		
row	marg-m	YES

mapcred -- mapcred(c,r)

Type: set

Domain: c,r

Model Variant: all

Units: Y/N

Mandatory: no

Description: selection of cases for which the modeled country faces an export demand curve with negative slope. In the rows and columns, we have commodities and countries, respectively. Thus, the mapping mapcred is used to signal which are the trade partners in the set r that are modeled with an export demand curve with a price-elasticity that is less than infinity.² The link has to be established for each of the traded commodities. In case mapcred(c,r) is left empty, the domestic country can export any quantity of commodity c to country r without changes in the FOB export price it receives. On the other hand, with YES indicates that the (bilateral) world export price for the modeled country decreases as its exports increase. Figure 9 shows an example.

Figure 9. Example mapcred.

mapcred(c,r)						
	r-e_u	r-usa	r-andinos	r-mercosur	r-chn	r-row
c-bananocafe	YES	YES	YES	YES	YES	YES
c-flores	YES	YES	YES	YES	YES	YES
c-otragric	YES	YES	YES	YES	YES	YES
c-petrol	YES	YES	YES	YES	YES	YES
c-miner	YES	YES	YES	YES	YES	YES
c-camaron	YES	YES	YES	YES	YES	YES

² The mappings are used to establish links between two or more sets; in our case, sets c and r, commodities and trade partners, respectively.

mapcrms -- mapcrms(c,r)

Type: set

Domain: c,r

Model Variant: all

Units: Y/N

Mandatory: no

Description: selection of cases for which the modeled country faces an import supply curve with positive slope. However, the typical assumption made in single country CGE models is that the supply curves of bilateral imports are horizontal. Thus, even in applications using a SAM that identifies multiple trade partners, it is likely that this sheet will be left empty.

maprtimp -- maprtimp(r,taximp)

Type: set

Domain: r,taximp

Model Variant: all

Units: Y/N

Mandatory: depends on SAM

Description: mapping between accounts in the SAM that refer to trade partners and accounts in the SAM that refer to import tariffs is established. The content of this mapping is used to define the initial import tariff rates $TM0(c,r,t)$. Figure 10 shows an example.

Figure 10. Example maprtimp.

maprtimp(r,taximp)						
	tax-imp-e_u	tax-imp-usa	tax-imp-andin	tax-imp-merc	tax-imp-chn	tax-imp-row
r-e_u	YES					
r-usa		YES				
r-andinos			YES			
r-mercosur				YES		
r-chn					YES	
r-row						YES

maprtexp -- maprtexp(r,taxexp)

Type: set

Domain: r,taxexp

Model Variant: all

Units: Y/N

Mandatory: depends on SAM

Description: mapping between accounts in the SAM that refer to trade partners and accounts in the SAM that refer to export taxes is established. The content of this mapping is used to define the initial export tax rates $TE0(c,r,t)$. Figure 11 shows an example. Of course, in case the modeled country does not collect export taxes, the sheet maprtexp should be left empty.

Figure 11. Example maprtexp.

maprtexp(r,taxexp)		
row	tax-exp	YES

msubcom -- msubcom(c,ac)

Type: set

Domain: c,ac

Model Variant: all

Units: Y/N

Mandatory: depends on SAM

Description: identifies the model agents (i.e., activities, households, government and investment) that receive consumption subsidies. Figure 12 shows an example. Obviously, the information in msubcom is only relevant when the SAM records consumption subsidies in a dedicated account; i.e., not as net commodity taxes.

Figure 12. Example msubcom.

msubcom(c,ac)	demande ac
	hhd
c-ele	YES
c-wtsn	YES
c-trns	YES
c-comunic	YES
c-otrsvc	YES

mc2c1 -- mc2c1(c2,c1)

Type: set

Domain: c2,c1

Model Variant: all

Units: Y/N

Mandatory: no

Description: mapping bt c2 and c1 (c2 is aggregated to c1). For example, mapcch could be used to link the commodities fuelwood, petroleum goods, and electricity to the consumed/composite commodity “energy”.

mffp -- mffp(f,fp)

Type: set

Domain: f,fp

Model Variant: all

Units: Y/N

Mandatory: no

Description: mapping between factor f (origin) and factor fp (destination) in factor migration function.

tstar000 -- tstar000(c,r,ac)

Type: parameter

Domain: c,r,ac

Model Variant: all

Units: rate (1 = 100%)

Mandatory: no

Description: base year tariff rate faced by the modeled country for commodity c in trade partner (country/region) r

dinam – dinam(ac,acp)

Type: parameter

Domain: ac,ac

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: yes

Description: information relevant for the dynamic version of the model (see figure 13). Row kappa+dummy provides the value of the parameter that refers to the speed with which the new capital can move across sectors. Rows netprfrat+capital factor provide the value of the net profit rate for each non-government capital, which are used to estimate the initial capital stocks when dmod=1 (see above).

Figure 13. Example dinam.

dinam(ac,acp)		
kappa	dummy	0.500
netprfrat	f-cap	0.125
netprfrat	f-cap-TnD	0.050
netprfrat	f-cap-Thermal	0.050
netprfrat	f-cap-Hydro	0.050
netprfrat	f-cap-Other	0.050

unemp – unemp(f,ac)

Type: parameter

Domain: f,ac

Model Variant: all

Units: rate (1 = 100%) and elasticity

Mandatory: no

Description: used to model the existence of endogenous unemployment for one or more factors in introduced. Column UERAT00 refers to the unemployment (or labor underutilization) rate in the base year (see figure 14 for an example). Column eta_wf refers to the elasticity of the wage curve that is use to model endogenous unemployment. Column UERAT200 refers to the unemployment rate showed in reports; typically, UERAT200<UERAT00 and the ratio between UERAT200 and UERAT00 is kept constant.

Figure 14. Example unemp.

unemp(f,ac)			
	UERAT00	eta_wf	UERAT200
f-lab-l	0.19870924	-1	0.09535524
f-lab-m	0.19870924	-1	0.09535524
f-lab-h	0.19870924	-1	0.09535524

ssgrw – ssgrw

Type: parameter

Domain: ac,ac

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: yes

Description: GDP growth rate that is imposed when it is assumed that the economy evolves in the baseline according to a balance growth path. In fact, when dmod=2, the growth rate in ssgrw is applied to all elements in the model that grow at an exogenous growth rate. Thus, it is ensured that the economy is on a balanced growth path.

gdpgrw -- gdpgrw(t)

Type: parameter

Domain: t

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: yes

Description: GDP at factor cost annual growth rate that will be imposed in the baseline when dmod=1; i.e., when the user assumes that the economy is not on a balanced growth path (see figure 15 for an example). Typically, a growth rate based on the recent past is used. Besides, this growth rate can be used to replicate the observed behavior of the economy during the period that goes from the base year to the current year. In addition, note that when dmod=2, gdpgrw=ssgrw.

Figure 15. Example gdpgrw.

gdpgrw(t)						
2011	2012	2013	2014	2015	2016	2017
0.06245	0.05001	0.04446	0.04538	0.046	0.043	0.04

tfp010 -- tfp010(a)

Type: parameter

Domain: a

Model Variant: dynamic

Units: [0,1]

Mandatory: yes

Description: 0-1 par determining (relative) rate of act a TFP growth (for GDP calibration)

($0 \leq \text{tfp01} \leq 1$)

tfpgrw -- tfpgrw(t)

Type: parameter

Domain: t

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: yes

Description: total factor productivity (TFP) annual growth rate that will be imposed in the baseline when $\text{dmod}=3$; i.e., when the user assumes that the economy is not on a balanced growth path and does not impose a fixed GDP at FC growth rate.

qfacgrw -- qfacgrw(f,t)

Type: parameter

Domain: f,t

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: yes

Description: growth rate for the supply of the factor identified in the model. Note that when the dynamic version of the model is used, the growth rate for the capital factor is ignored, given that its supply is endogenous. In addition, note that when $dmod=2$, $qfacgrw(f)=ssgrw$.

fprdbgrw2 -- fprdbgrw2(f,t)

Type: parameter

Domain: f,t

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: yes

Description: growth in productivity of factor f in t.

pop0 – pop0(acpop,t)

Type: parameter

Domain: acpop,t

Model Variant: dynamic

Units: physical

Mandatory: yes

Description: population projections for each representative household identified in the SAM are introduced. Naturally, if the SAM identifies only one representative household, in this sheet the user must introduced data for the total population of the modeled country.

qfbase – qfbase(f,a)

Type: parameter

Domain: ac,ac

Model Variant: all

Units: physical

Mandatory: yes

Description: for labor, number of workers in each labor category demanded by each activity. The data must be introduced as a table, with labor categories in its rows and activities in its columns. The number of workers is used in the model code to compute the “distortion factor” that allows factor remunerations to (exogenously) differ across activities. Besides, in case of introducing in qfbase, the variables that report labor supply and demand will be expressed in “number of workers”.

qfor0 -- qfor0(acfor,t)

Type: parameter

Domain: acfor,t

Model Variant: all

Units: physical

Mandatory: yes

Description: number of hectares in some or all of the following land use categories:

- fornprod: non-productive forest
- forplant: forest plantations
- livestock: pastures
- crops: crops

labpartrat0 -- labpartrat0(t)

Type: parameter

Domain: t

Model Variant: all

Units: rate (1 = 100%)

Mandatory: yes

Description: labor force participation rate or ratio between labor force and population at labor force age

deprcap -- deprcap(fcap)

Type: parameter

Domain: fcap

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: yes

Description: depreciation rates for public (row govz) and private (row ngovz) are introduced. Based on available estimates, the former is smaller than the last one. As an example, see figure 16.

Figure 16. Example deprcap.

deprcap(ac)	
f-capg	0.025
f-cap	0.050

qxbase -- qxbase(c)

Type: parameter

Domain: c

Model Variant: all

Units: physical

Mandatory: no

Description: physical units for the supply of selected commodities. Then, the prices PX, PDS, PE, and PXAC will be initialized accordingly. Similar to qfbase, if physical units are used, the user should select the unit (e.g., tons vs. '000 tons) so that initial price and quantity variables are reasonably scaled (for example between 0.01 and 1000) -- bad scaling may cause solver problems.

qabase -- qabase(a,t)

Type: parameter

Domain: a,t

Model Variant: all

Units: physical

Mandatory: no

Description: activity output expressed in physical units, such tons or GWH for electricity. In the model code, the corresponding activity price is computed accordingly.

prodelas -- prodelas(a,ac)

Type: parameter

Domain: a,ac

Model Variant: all

Units: n.a.

Mandatory: yes

Description: elasticities of substitution between factors are introduced. Note that the value-added production function is a CES function. Thus, a value that is close to zero for prodelas means that factors are poor substitutes; in contrast, for higher values of prodelas, factors can be substituted more easily. In the simplest case, the user must introduce an elasticity value for each activity in the SAM in column sigma_VAE (see figure 17). The other columns are used to model the substitution between the different energy inputs identified in the set cenerg. Specifically,

- $\sigma_{va}(a)$ = elasticity of substitution VA-Energy
- $\sigma_{ll}(a)$ = elasticity of substitution labor-non-land natural resources
- $\sigma_{ken}(a)$ = elasticity of substitution capital-Energy
- $\sigma_{en}(a)$ = elasticity of substitution energy inputs
- $\sigma_{landwat}(a)$ = elasticity of substitution land-water
- $\sigma_{wat}(a)$ = elasticity of substitution water inputs

Figure 17. Example prodelas.

prodelas(a,ac)				
	sigma_VAE	sigma_KE	sigma_LL	sigma_EE
a-cafe	0.250	0.800	0.500	0.900
a-otragr	0.250	0.800	0.500	0.900
a-ganad	0.250	0.800	0.500	0.900
a-for	0.200	0.800	0.500	0.900
a-lenia	0.200	0.800	0.500	0.900
a-pesca	0.200	0.800	0.500	0.900
a-min	0.200	0.800	0.500	0.900
a-genterm-g	1.100	0.800	0.500	0.900
a-genhidro-g	1.100	0.800	0.500	0.900
a-genterm-ng	1.100	0.800	0.500	0.900
a-gengeoterm	1.100	0.800	0.500	0.900
a-genhidro-ng	1.100	0.800	0.500	0.900
a-genbiomas	1.100	0.800	0.500	0.900
a-geneolica-n	1.100	0.800	0.500	0.900
a-trnsele	1.100	0.800	0.500	0.900
a-distele	1.100	0.800	0.500	0.900

migrelas – (f,fp)

Type: parameter

Domain: f,fp

Model Variant: all

Units: n.a.

Mandatory: no

Description: elasticity of factor migration with respect to average wage ratio between f and fp.

facsupelas – facsupelas(f)

Type: parameter

Domain: f

Model Variant: all

Units: n.a.

Mandatory: no

Description: elasticity of factor supplies with respect to average wage.

leselas -- leselas(c,h)

Type: parameter

Domain: c,h

Model Variant: all

Units: n.a.

Mandatory: yes

Description: income (expenditure)-elasticities for each commodity demanded by the households in the SAM are introduced (see example in figure 18). In order to calibrate the model, (Muhammad, Seale et al. 2011) provide comparable estimate for a large number of countries.³

Figure 18. Example leselas.

leselas(c,h)	
	hhd
c-cereal	0.679
c-otrcultivos	0.679
c-ganaderia	0.679
c-silvicultura	1.324
c-pesca	0.679
c-petgas	1.324
c-otrmin	1.324
c-carne	0.679
c-lacteos	0.679
c-otralimen	0.679
c-bebtab	0.679
c-textiles	0.966
c-cuerocalzac	0.966
c-madera	1.324
c-papel	1.324

frisch -- frisch(h)

Type: parameter

³ Note that, if necessary, the model code rescales these elasticities in order to meet the Engel aggregation condition; i.e.,

$$\sum_c w_{ch} \eta_{ch} = 1$$

where w_{ch} is the share of commodity c in total consumption of household h , and η_{ch} is the income-elasticity of demand of commodity c for household h .

Domain: h

Model Variant: all

Units: n.a.

Mandatory: yes

Description: Frisch parameter for each representative household in the SAM. As explained in Dervis et al. (1982), this parameter is used to calibrate the linear expenditure system that can be derived from the assumption of Stone-Geary utility function for households (Dervis, de Melo et al. 1982). The value of the Frisch parameter can be computed following Luch et al. (1977), who estimated the following relation (Luch, Powell et al. 1977):

$$frisch = -36 \cdot ypc^{-0.36}$$

where *ypc* is the income per capita in US dollars of 1970. Thus, the value of the Frisch parameter can be estimates based on data for the income per capita for the model base year expressed in US dollars of 1970.

conelas1 -- conelas1(c1,h)

Type: parameter

Domain: ac,ac

Model Variant: all

Units: n.a.

Mandatory: no

Description: elasticities of substitution between the individual commodities that, through the mapping mc2c1(c2,c1) are linked together to a composite consumed commodity (see above). As said before, a CES function is used to combine the disaggregated commodities into the composite demand commodity. As an example, see figure 19.

Figure 19. Example conelas1.

conelas1(c1,h)								
c-trns	h-rur-labl	h-rur-labm	h-rur-labh	h-rur-cap	h-rur-trow	h-rur-trssec	h-rur-trgov	h-rur-trmpish
	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

mps000 -- MPS000(ins)

Type: parameter

Domain: ac,ac

Model Variant: all

Units: rate (1 = 100%)

Mandatory: no

Description: marginal propensity to save of domestic non-government institutions. In case no data is provided, it is assumed that the intercept in the savings functions is zero at the same time that MPS00 is computed using data from the SAM.

tradelas -- tradelas(c,ac)

Type: parameter

Domain: c,ac

Model Variant: all

Units: n.a.

Mandatory: yes

Description: trade-related elasticities are introduced. Specifically, in column sigma_Q (sigma_X) Armington (CET) elasticities are introduced. In turn, columns sigma_MR and sigma_ER refer to the second level Armington and CET elasticities, respectively; i.e. substitution between imports of different origin and transformation between exports to different destinations. As can be seen, elasticities can be different among commodities.

tradelas2 -- tradelas2(c,r)

Type: parameter

Domain: c,r

Model Variant: all

Units: n.a.

Mandatory: no

Description: price-elasticities of export demand functions for the trade partners of the modeled country. Alternatively, these are price-elasticities for the import demand functions of the trade partners of the modeled economy.

facclos0 – facclos0(f)

Type: parameter

Domain: f

Model Variant: all

Units: 1,2,3,4

Mandatory: yes

Description: closure rule (i.e., the mechanism to equilibrate supply and demand) for the factor markets; this model provides four pre-programmed alternatives:

- $facclos0(f) = 1$ factor is fully employed and perfectly mobile among sectors;
- $facclos0(f) = 2$ factor is fully employed and sector specific (i.e., immobile);
- $facclos0(f) = 3$ factor is unemployed with an horizontal supply curve and mobile among sectors; and
- $facclos0(f) = 4$ factor in unemployed with a wage curve and mobile among sectors.

Typically, the second alternative is used for the capital factor in the context of a short run/medium run simulation, where it is assumed that installed capital cannot move between productive sectors. The third alternative assumes that factor supply is horizontal; in other words, factor supply is perfectly elastic. In model terms, table 3 shows the endogenous and exogenous variables in each of the four alternatives.

Table 3. $facclos0(f)$.

#	workings of factor markets	variables flexed
1	full employment (fixed UERAT); mobile factor	$WF(f) + QF(f,a)$
2	full employment (fixed UERAT); specific factor	$WDFIST(f,a) + QFS(f)$
3	unemployment assuming exogenous (constant) real wage; mobile factor	$QF(f,a) + QFS(f)$
4	unemployment assuming wage curve (i.e., negative relation bt real wage and UERAT); mobile factor	$WF(f) + QF(f,a) + UERAT(f) + \text{wage curve}$

numeraire0 – numeraire0

Type: parameter

Domain: n.a.

Model Variant: all

Units: 1,2

Mandatory: yes

Description: model numeraire; two pre-programmed alternatives are available: (1) the model numeraire is the consumer price index, and (2) the model numeraire is the index for domestic producer prices. In table 4 we show the endogenous and exogenous variables in each case.

Table 4. numeraire0.

#	numeraire	CPI	DPI
1	consumer price index	fix	flex
2	producer price index	flex	fix

govclos0 – govclos0

Type: parameter

Domain: n.a.

Model Variant: all

Units: 1,2,3,4,5,6,7,8,9

Mandatory: yes

Description: selection of one of the nine available (pre-programmed) closures to balance the government budget. In table 5 the available alternatives are shown, together to the endogenous and exogenous variables corresponding to each case.

Table 5. govclos0.

#	variable that clears the government budget
1	direct (income) tax rate
2	government real savings (domestic financing)
3	foreign financing
4	government (current) consumption
5	government investment
6	transfers from rest of the world
7	transfers to domestic non-gov inst
8	commodity subsidies
9	commodity tax

siclos0 – siclos0

Type: parameter

Domain: n.a.

Model Variant: all

Units: 1,2,3,4

Mandatory: yes

Description: selection of the clearing variable for the savings-investment balance. In Table 6, the endogenous and exogenous variables that correspond to each option are shown.

Table 6. siclos0.

#	variable that clears the savings-investment balance
1	non-government investment
2	marg propensity to save inst dom non-gov
3	net foreign financing
4	government (real) net domestic financing (*)

(*) cannot be selected together with govclos = 2

rowclos0 – rowclos0

Type: parameter

Domain: n.a.

Model Variant: all

Units: 1

Mandatory: yes

Description: selection of the clearing variable for the current account of the balance of payments. In other words, the mechanism for balancing inflows and outflows of foreign exchange is selected. In the first and only case, the real exchange rate is the clearing variables that drives exports and imports to be consistent with the exogenous current account balance (i.e., minus SAVF). Table 7 shows the selection of endogenous and exogenous variable in each case.

Table 7. rowclos0.

	variable that clears the current account
#	BoP
1	real exchange rate

govrecrule0 -- govrecrule0(acgovrec)

Type: parameter

Domain: acgovrec

Model Variant: all

Units: 1,2,3

Mandatory: yes

Description: selection of the behavior for each of the income sources for the government. The available alternatives are two: (1) exogenous growth rate (determined through govrecgrw0), o (2) exogenous GDP ratio (determined through govrecgdp0) (see figure 20). The government income sources identified in the model are

- ‘trgovngov’ = transfers from domestic institutions (i.e., households and/or enterprises)
- ‘trgovrow’ = transfers from the rest of the world (i.e., foreign aid)
- ‘netforfingov’ = government net foreign financing
- ‘netdomfin’ = government net domestic financing
- elements of the set actax (i.e., taxes)

Figure 20. Example govrecrule0.

govrecrule0(acgovrec)	
trgovngov	2
trgovrow	2
tax-dir	1
tax-com	1
tax-imp	1
tax-act	1
tax-vat	1

govrecindex0 -- govrecindex0(acgovrec,t)

Type: parameter

Domain: acgovrec,t

Model Variant: dynamic

Units: index

Mandatory: no

Description: growth rates for the government receipts items identified in govrecrule0.

govrecgdp0 -- govrecgdp0(acgovrec,t)

Type: parameter

Domain: acgovrec,t

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: no

Description: GDP ratios for the government receipts items identified in govrecrule0.

govspndrule0 -- govspndrule0(acgovspnd)

Type: parameter

Domain: acgovspnd

Model Variant: all

Units: 1,2,3

Mandatory: yes

Description: selection of the behavior for each of the spending items of the government. The available alternatives are two: (1) exogenous growth rate (determined through govspndgrw0), o (2) exogenous GDP ratio (determined through govspndgdp0) (see figure 21). The government spending items identified in the model are

- ‘trngovgov’
- ‘trrowgov’
- ‘savgov’
- ‘congov’
- elements of the set subcom (i.e., consumption subsidies)
- elements of the set fcapg (i.e., government investment))
- elements of the set fcapng (i.e., non-government investment))

Figure 21. Example govspndrule0.

govspndrule0(acgovspnd)	
trngovgov	2
trrowgov	2
savgov	2
congov	2
sub-com	1
invg-inf	2
invg-ogov	2

govspndindex0 -- govspndindex0(acgovspnd,t)

Type: parameter

Domain: acgovspnd,t

Model Variant: dynamic

Units: index

Mandatory: no

Description: growth rates for the government spending items identified in govspndrule0.

govspndgdp0 -- govspndgdp0(acgovspnd,t)

Type: parameter

Domain: acgovspnd,t

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: no

Description: GDP ratios for the government spending items identified in govspndrule0.

ngovpayrule0 -- ngovpayrule0(acngovpay)

Type: parameter

Domain: acngovpay

Model Variant: all

Units: 1,2,3

Mandatory: yes

Description: selection of the behavior for each of the modeled non-government payments (e.g., remittances, factor income from abroad, domestic non-government savings, among others). The available alternatives are two: (1) exogenous growth rate (determined through ngovpaygrw0), o (2) exogenous GDP ratio (determined through ngovpaygdp0) (see figure 22). The government income sources identified in the model are

- ‘trngovrow’ = transfers from rest of the world to domestic non-government institutions
- ‘trowngov’ = not yet available; currently, fixed share of domestic non-government institutions income
- ‘trfacrow’ = factor income from abroad
- ‘trowfac’ = not yet available; currently, fixed share of factor income
- ‘netforfinngov’ = non-government net foreign financing
- ‘fdiz’ = foreign direct investment
- ‘savngov’ = savings of domestic non-government institutions
- elements of the set fcapng (i.e., non-government investment)
- elements of the set fcapg (i.e., government investment)

- elements of the set instrst (i.e., foreign tourists)

Figure 22. Example ngovpayrule0.

ngovpayrule0(acngovpay	
trngovrow	2
trrowngov	2
trfacrow	2
trrowfac	2
savngov	2
savrow	2
invng-otr	2
invng-elegenn	2
invng-eletrnsn	2
invng-elegeng	2
invng-eledist	2

ngovpayindex0 -- ngovpayindex0(acngovpay,t)

Type: parameter

Domain: acngovpay,t

Model Variant: dynamic

Units: index

Mandatory: no

Description: growth rates for the non-government payment items identified in ngovpayrule0.

ngovpaygdp0 -- ngovpaygdp0(acngovpay,t)

Type: parameter

Domain: acngovpay,t

Model Variant: dynamic

Units: rate (1 = 100%)

Mandatory: no

Description: GDP ratios for the non -government payment items identified in ngovpayrule0.

povmodule -- povmodule(acpov)

Type: parameter

Domain: acpov

Model Variant: all

Units: n.a.

Mandatory: no

Description: selection of (i) approach to poverty and inequality computations; and (ii) welfare index. CGE-Haiti permits post-calculation of major poverty and inequality indicators. If this sheet is left blank, poverty and inequality results will not be generated. If information is incomplete, diagnostic errors will be generated. The analyst has to specify values for approach and welfareindex.

Definition of approach:

- approach: 1 = constant elasticity of poverty wrt growth
- approach 2 = log-normal distribution
- approach 3 = household survey

Definition of welfare index:

- welfareindex 1 = income
- welfareindex 1 = consumption spending

povdata -- povdata(ac,acpov)

Type: parameter

Domain: ac,acpov

Model Variant: all

Units: n.a.

Mandatory: no

Description: data for household h on the following poverty-related indicators acpov:

- p0 = headcount ratio
- p0elas = constant elasticity of poverty wrt growth
- gini = Gini coefficient

hhdsurvey -- hhdsurvey(obs,isurvey)

Type: parameter

Domain: obs,isurvey

Model Variant: all

Units: monetary

Mandatory: no

Description: household survey data containing the following variables (in columns):

- obs = observation number
- popwt = population weight
- povline = poverty line
- welfare = value for welfare indicator (income or consumption spending)

mobsh -- mobsh(obs,h)

Type: set

Domain: obs,h

Model Variant: all

Units: monetary

Mandatory: no

Description: mapping from individual observations in household survey (see hhdsurvey) and representative households in the SAM.

debt00 -- debt00(ac,acp)

Type: parameter

Domain: ac,acp

Model Variant: all

Units: monetary

Mandatory: no

Description: base-year debts of institution (column) "insp" to institution (row) "ins(ac)" are introduced. Note the use of "tot-insdng" to refer to the aggregate of domestic non-government institutions. It is expressed in the same units as SAM. Figure 23 shows an example.

Figure 23. example debt00.

debt00(ac,insp)		base-year debts of institution (column) "insp" to institution (i				
	gov	h-rur-q1	h-rur-q2	h-rur-q3	h-rur-q4	h-rur-q5
row	18,668,298	280,024	280,024	280,024	280,024	280,024
tot-insdng	933,414.900					

gintrat0 -- gintrat0(t)

Type: parameter

Domain: t

Model Variant: all

Units: rate (1 = 100%)

Mandatory: no

Description: real interest rate on domestic government debt are introduced.

fintrat0 -- fintrat0(insd,t)

Type: parameter

Domain: insd,t

Model Variant: all

Units: rate (1 = 100%)

Mandatory: no

Description: real interest rates on foreign debt are introduced. Figure 24 shows an example.

Figure 24. Example fintrat0.

fintrat0(insd,t)	real interest rate on foreign debt					
	2010	2011	2012	2013	2014	2015
h-rur-q1	0.01	0.01	0.01	0.01	0.01	0.01
h-rur-q2	0.01	0.01	0.01	0.01	0.01	0.01
h-rur-q3	0.01	0.01	0.01	0.01	0.01	0.01
h-rur-q4	0.01	0.01	0.01	0.01	0.01	0.01
h-rur-q5	0.01	0.01	0.01	0.01	0.01	0.01
h-urb-q1	0.01	0.01	0.01	0.01	0.01	0.01
h-urb-q2	0.01	0.01	0.01	0.01	0.01	0.01
h-urb-q3	0.01	0.01	0.01	0.01	0.01	0.01
h-urb-q4	0.01	0.01	0.01	0.01	0.01	0.01
h-urb-q5	0.01	0.01	0.01	0.01	0.01	0.01
entng	0.01	0.01	0.01	0.01	0.01	0.01
entg	0.01	0.01	0.01	0.01	0.01	0.01
gov	0.01	0.01	0.01	0.01	0.01	0.01

mpcapgov – mpcapgov(fcapg)

Type: parameter

Domain: fcapg

Model Variant: all

Units: rate (1 = 100%)

Mandatory: no

Description: marginal product of government capital.

mtfp -- mtfp(a,fcapg)

Type: parameter

Domain: a,fcapg

Model Variant: all

Units: [0,1]

Mandatory: no

Description: mapping - TFP in activity a affected by capital stock f, with relative value indicating strength of effect.

exrdol00

Type: parameter

Domain: a,fcapg

Model Variant: all

Units: [0,1]

Mandatory: no

Description: base-year nominal exchange rate to be used in selected reports.

scaling – scaling(acscal)

Type: parameter

Domain: acscal

Model Variant: all

Units: numeric

Mandatory: yes

Description: scaling values for SAM, number of workers (see qfbase), land use (see qfor0), population (see pop0), emissions (see emibase), and water use (see watbase). The number one means that no scaling is made.

layout

Type: n.a.

Domain: n.a.

Model Variant: all

Units: n.a.

Mandatory: yes

Description: defines how the information in the Excel file is organized. In general, the user should not modify this sheet.

5. Simulations File

In this section we describe the content of each element in the ISIM application Excel file; for example, app-sim.xlsx, where app refers to a particular application; for example, demo-sim.xlsx. As we will see, the simulation scenarios can combine different shocks; i.e., the same scenario name can appear in more than one of the simulation parameters

that are described next. For example, we can define a scenario that combines a reduction in the import tariff rate of a specific commodity with an increase in the world import price of that same (or other) commodity.

sim – sim

Type: set

Domain: n.a.

Model Variant: all

Units: n.a.

Description: name for each of the simulation scenarios that will be defined; the “base” simulation should not be deleted – it corresponds to the reference scenario that is used to calibrate the model. Alternatively, it is the starting point for the non-base simulations. If using ISIM, the simulation names should be entered through the Scenario Manager. Figure 25 shows an example; besides the base simulation, we have created various additional simulations.

Figure 25. Example sim.

sim	
base	escenario base
num-2	duplicación numerario
tarcut	eliminación aranceles
remesas-dec	reducción remesas 75%
pwefood	aumento precio mundial export alimentos 50%
pwmfood	aumento precio mundial import alimentos 50%
pwfood	aumento precio mundial export e import alimentos 50%

simcur -- simcur(sim)

Type: set

Domain: sim

Model Variant: all

Units: n.a.

Description: selection of the simulation scenarios that should be run. Thus, the set of simulations simcur is a subset of the simulations in sim. If using ISIM, the selection is made through the Scenario Manager.

5.1 Closure and Rules

facclsim – facclsim(sim,f)

Type: parameter

Domain: sim,f

Model Variant: all

Units: 1,2,3,4

Description: selection of the closure rule for the factor markets in each of the scenarios; the available alternatives are the same as those presented above for faccl0. By default (i.e., when no selection is made), all simulations assume the same closure rule that was selected in [faccl0](#) (i.e., the value used in the pre-programmed reference scenario). However, that default is overwritten if a selection is made for the base scenario. Table 3 ([faccl0](#)) shows the available options.

numeraresim -- numeraresim(sim)

Type: parameter

Domain: sim

Model Variant: all

Units: 1,2

Description: selection of the numeraire for each simulation. The selection made for the calibration/reference scenario is the default for all non-base simulations. In case no selection is made for the base scenario, the value for numeraire0 (i.e., for the reference scenario) is used as the default for all non-base simulations. Table 4 ([numeraire0](#)) shows the available (pre-programmed) options.

govclsim – govclsim(sim)

Type: parameter

Domain: sim

Model Variant: all

Units: 1,2,3,4,5,6,7,8,9

Description: selection of the government closure rule for each scenario. The available options are the same as the ones described for the calibration/reference scenario (see [govclos0](#)). This is an optional parameter; by default, it is assumed that all non-base simulations implement the closure selected for the base scenario. In case no selection is made for the base scenario, the selection from the model calibration/setup is used. Table 5 ([govclos0](#)) shows the available (pre-programmed) options.

siclossim – siclossim(sim)

Type: parameter

Domain: sim

Model Variant: all

Units: 1,2,3,4

Description: selection of the savings-investment closure rule for each scenario. The available options are the same as the ones described for the calibration/reference scenario (see [siclos0](#)). This is an optional parameter; by default, it is assumed that all non-base simulations implement the closure selected for the base scenario. In case no selection is made for the base scenario, the selection from the model calibration/setup is used. Table 6 ([siclos0](#)) shows the available (pre-programmed) options.

rowclossim – rowclossim(sim)

Type: parameter

Domain: sim

Model Variant: all

Units: 1

Description: selection of the variable that balances the inflows and outflows of foreign exchange in each simulation. The selection made for the calibration/reference scenario is the default for all non-base simulations. In case no selection is made for the base scenario, the value for [rowclos0](#) (i.e., for the reference scenario) is used as the default for all non-base simulations. Table 7 ([rowclos0](#)) shows the available (pre-programmed) options.

govrecrulesim -- govrecrulesim(sim,acgovrec)

Type: parameter

Domain: sim,acgovrec

Model Variant: all

Units: 1,2,3

Description: the working of govrecrulesim is the same as the one described above for [govrecrule0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim). The selection made for the “base” scenario is the default for the non-base simulations. In case no value is specified for the “base” scenario, the value assigned to govrecrule0 in the data file (i.e., for generating the reference scenario) is used as default.

govrecindexsim -- govrecindexsim(sim,acgovrec,t)

Type: parameter

Domain: sim,acgovrec,t

Model Variant: dynamic

Units: index

Description: the working of the govrecgrwsim is the same as the one described above for the [govrecindex0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim).

govrecgdpsim -- govrecgdpsim(sim,acgovrec,t)

Type: parameter

Domain: sim,acgovrec,t

Model Variant: dynamic

Units: rate (1 = 100%)

Description: the working of the govrecgdpsim is the same as the one described above for the [govrecgdp0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim).

govspndrulesim -- govspndrulesim(sim,acgovspnd)

Type: parameter

Domain: sim,acgovspnd

Model Variant: all

Units: 1,2,3

Description: the working of govspndrulesim is the same as the one described above for [govspndrule0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim). The selection made for the “base” scenario is the default for the non-base simulations. In case no value is specified for the “base” scenario, the value assigned to govspndrule0 in the data file (i.e., for generating the reference scenario) is used as default.

govspndindexsim -- govspndindexsim(sim,acgovspnd,t)

Type: parameter

Domain: sim,acgovspnd,t

Model Variant: dynamic

Units: index

Description: the working of the govspndgrwsim is the same as the one described above for the [govspndindex0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim).

govspndgdpsim -- govspndgdpsim(sim,acgovspnd,t)

Type: parameter

Domain: sim,acgovspnd,t

Model Variant: dynamic

Units: rate (1 = 100%)

Description: the working of the govspndgdpsim is the same as the one described above for the [govspndgdp0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim).

ngovpayrulesim -- ngovpayrulesim(sim,acngovpay)

Type: parameter

Domain: sim,acngovpay

Model Variant: all

Units: 1,2,3

Description: the working of ngovpayrulesim is the same as the one described above for [ngovpayrule0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim). The selection made for the “base” scenario is the default for the non-base simulations. In case no value is specified for the “base” scenario, the value assigned to ngovpayrule0 in the data file (i.e., for generating the reference scenario) is used as default.

ngovpayindexsim -- ngovpayindexsim(sim,acngovpay,t)

Type: parameter

Domain: sim,acngovpay,t

Model Variant: dynamic

Units: index

Description: the working of the ngovpaygrwsim is the same as the one described above for the [ngovpayindex0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim).

ngovpaygdpsim -- ngovpaygdpsim(sim,acngovpay,t)

Type: parameter

Domain: sim,acngovpay,t

Model Variant: dynamic

Units: rate (1 = 100%)

Description: the working of the gngovpaygdpsim is the same as the one described above for the [ngovpaygdp0](#), although adding the “sim” dimension (i.e., one or more of the elements of set sim).

5.2 Taxes and Subsidies

tasim – tasim(sim,a,t)

Domain: sim,a,t

Units: index

Description: activity tax rates as deviations with respect to the base scenario (i.e., 1 means no change, 2 means 100% increase).

ta2sim -- ta2sim(sim,a,t)

Domain: sim,a,t

Units: rate (1 = 100%)

Description: activity tax rates as a levels.

tco2sim -- tco2sim(sim,a,t)

Domain: sim,a,t

Units: index

Description: tax rates on CO2 emissions as deviations with respect to the base scenario.

tco22sim -- tco22sim(sim,a,t)

Domain: sim,a,t

Units: rate (1 = 100%)

Description: tax rates on CO2 emissions as levels.

tesim -- tesim(sim,c,t)

Domain: sim,c,t

Units: index

Description: tax rates on exports as deviations with respect to the base scenario; the simulated export tax rate for commodity c in simulation sim in period t is computed as

$te(c,t) = te0(c,t)$ if $tesim(sim,c,t) = 0$

$te(c,t) = te0(c,t) * tesim(sim,c,t)$ if $tesim(sim,c,t) <> 0$

te2sim -- te2sim(sim,c,t)

Domain: sim,c,t

Units: rate (1 = 100%)

Description: tax rates on exports as levels; the simulated export tax rate is computed as

$te(c,t) = te0(c,t)$ if $te2sim(sim,c,t) = 0$

$te(c,t) = te2sim(sim,c,t)$ if $te2sim(sim,c,t) <> 0$

Note that te2sim can be used to introduce export taxes/subsidies in cases where there are no such taxes in the SAM; i.e., the reference scenario does not show the existence of export taxes.

tfactsim -- tfactsim(sim,f,a,t)

Domain: sim,f,a,t

Units: index

Description: tax rates on factor use (e.g., social security contributions) as deviations with respect to the base scenario.

tfact2sim -- tfact2sim(sim,f,a,t)

Domain: sim,f,a,t

Units: rate (1 = 100%)

Description: tax rates on factor use (e.g., social security contributions) as levels.

tmsim -- tmsim(sim,c,r,t)

Domain: sim,c,r,t

Units: index

Description: import tariff rates as deviations with respect to the base scenario; the counterfactual import tariff rate for commodity c in simulation sim in period t is computed as

$$tm(c,t) = tm0(c,t) \quad \text{if } tmsim(sim,c,t) = 0$$

$$tm(c,t) = tm0(c,t) * tmsim(sim,c,t) \quad \text{if } tmsim(sim,c,t) \diamond 0$$

For example, 1.25 implies a 25% increase. Figure 26 shows an example; specifically, the tarcut-pesad scenario simulates a unilateral elimination of import tariffs during the period 2011-2013 for the following heavy manufactures: c-refpet, c-quimica, c-prodminnomet, c-met, and c-maq.

Figure 26. Example tmsim.

tmsim(sim,c,r,t)			tm = tm0 x tmsim			
			2010	2011	2012	2013
tarcut-pesad	c-refpet	row	1	EPS	EPS	EPS
tarcut-pesad	c-quimica	row	1	EPS	EPS	EPS
tarcut-pesad	c-prodminnon	row	1	EPS	EPS	EPS
tarcut-pesad	c-met	row	1	EPS	EPS	EPS
tarcut-pesad	c-maq	row	1	EPS	EPS	EPS

tm2sim – tmsim(sim,c,r,t)

Domain: sim,c,r,t

Units: rate (1 = 100%)

Description: import tariff rates as levels; the counterfactual import tariff rate for commodity c in simulation sim in period t is computed as

$$tm(c,t) = tm0(c,t) \quad \text{si } tm2sim(sim,c,t) = 0$$

$$tm(c,t) = tm2sim(sim,c,t) \quad \text{si } tm2sim(sim,c,t) <> 0$$

Thus, as opposed to tmsim(sim,c), this simulation parameter can be used to introduce import tariffs in cases where there are no such taxes in the SAM; i.e., the reference scenario does not show the existence of import tariffs for all or selected commodities.

tqsim – tqsim(sim,c,t)

Domain: sim,c,t

Units: index

Description: tax rates on sales as deviations with respect to the base scenario.

tq2sim – tqsim(sim,c,t)

Domain: sim,c,t

Units: rate (1 = 100%)

Description: tax rates on sales as levels.

tstarsim -- tstarsim(sim,c,r,t)

Domain: sim,c,r,t

Units: index

Description: import tariff rates imposed by trade partners as deviations relative to the base scenario; the counterfactual import tariff rates are computed as

$$tstar(c,r,t) = tstar0(c,r,t) \quad \text{if } tstarsim(sim,c,r,t) = 0$$

$$tstar(c,r,t) = tstar0(c,r,t) * tstarsim(sim,c,r,t) \quad \text{if } tstarsim(sim,c,r,t) \neq 0$$

Typically, this parameter would be used when the SAM used for model calibration identifies more than one trade partner.

tstar2sim – tstar2sim(sim,c2,r2,t)

Domain: sim,c,r,t

Units: rate (1 = 100%)

Description: import tariff rates imposed by trade partners as levels; the counterfactual import tariff rates are computed as

$$tstar(c,r,t) = tstar0(c,r,t) \quad \text{if } tstar2sim(sim,c,r,t) = 0$$

$$tstar(c,r,t) = tstar2sim(sim,c,r,t) \quad \text{if } tstar2sim(sim,c,r,t) \neq 0$$

Typically, this parameter would be used when the SAM used for model calibration identifies more than one trade partner.

tvacsim – tvacsim(sim,c,ac,t)

Domain: sim,c,ac,t

Units: index

Description: value added tax rates as deviations relative to the base scenario; the user can use “all” in c to make reference to all commodities, and “act” in ac to make reference to all activities.

tvac2sim -- tvac2sim(sim,c,ac,t)

Domain: sim,c,ac,t

Units: rate (1 = 100%)

Description: value added tax rates as levels; the user can use “all” in c to make reference to all commodities, and “act” in ac to make reference to all activities.

tysim – tasim(sim,insdng,t)

Domain: sim,insdng,t

Units: index

Description: income tax rates as deviations relative to the base scenario.

ty2sim -- ty2sim(sim,insdng,t)

Domain: sim,insdng,t

Units: rate (1 = 100%)

Description: income tax rates as levels.

subcsim -- subcsim(sim,c,d,t)

Domain: sim,c,d,t

Units: index

Description: intermediate and/or consumption subsidy rates as deviations relative to the base scenario. For example, Figure 27 shows how to eliminate the consumption subsidy on product c-ele received by the households during the period 2011-2014.

Figure 27. Example subcom.

gammacsim(sim,c,ac,t)			2010	2011	2012	2013	2014
subelecut	c-ele	hhd	1	EPS	EPS	EPS	EPS

5.3 World Prices

pwesim -- pwesim(sim,c,t)

Domain: sim,c,t

Units: index

Description: world price of exports; the counterfactual value for pwe for commodity c in period t in simulation sim is computed as

$$pwe(c,t) = pwe0(c,t) \quad \text{if } pwesim(sim,c,t) = 0$$

$$pwe(c,t) = pwe0(c,t)*pwesim(sim,c,t) \quad \text{if } pwesim(sim,c,t) \neq 0$$

pwmsim -- pwmsim(sim,c,t)

Domain: sim,c,t

Units: index

Description: world price of imports. The counterfactual value for pwm for commodity c in simulation sim in period t is computed as

$$\begin{aligned} \text{pwm}(c,t) &= \text{pwm0}(c,t) && \text{if } \text{pwmsim}(\text{sim},c,t) = 0 \\ \text{pwm}(c,t) &= \text{pwm0}(c,t) * \text{pwmsim}(\text{sim},c,t) && \text{if } \text{pwmsim}(\text{sim},c,t) \neq 0 \end{aligned}$$

5.4 Exports and Domestic Sales

cedexog01sim -- cedexog01sim(sim,c)

Domain: sim,c

Units: 0,1

Description: selection (option 1) of the commodities with exogenous export demand and world price in a particular simulation; commodities that are not exported in the base year cannot be included in cedexog01sim.

qebarsim -- qebarsim(sim,c,t)

Domain: sim,c,t

Units: index

Description: exogenous volume of sectoral exports. It applies to commodities in the set cedexog(sim,c) (see [cedexogsim01sim](#)). The counterfactual value for qebar for commodity c in simulation sim in period t is computed as

$$\begin{aligned} \text{qebar}(c,r,t) &= \text{qebar0}(c,r,t) && \text{if } \text{qebarsim}(\text{sim},c,r,t) = 0 \\ \text{qebar}(c,r,t) &= \text{qebar0}(c,r,t) * \text{qebarsim}(\text{sim},c,r,t) && \text{if } \text{qebarsim}(\text{sim},c,r,t) \neq 0 \end{aligned}$$

qebar2sim -- qebar2sim(sim,c,t)

Domain: sim,c,t

Units: monetary; same units as SAM

Description: exogenous volume of sectoral exports; it applies to commodities in the set cedexog01(sim,c) (see [cedexogsim01sim](#)). The counterfactual value for qebar for commodity c in simulation sim in period t is computed as

$$\text{qebar}(c,r,t) = \text{qebar0}(c,r,t) \quad \text{if } \text{qebar2sim}(\text{sim},c,r,t) = 0$$

$q\bar{e}bar(c,r,t) = q\bar{e}bar0(c,r,t) + q\bar{e}bar2sim(sim,c,r,t)/scaling('samsol')$ if
 $q\bar{e}bar2sim(sim,c,r,t) <> 0$

qdbarsim -- qdbarsim(sim,c,t)

Domain: sim,c,t

Units: index

Description: exogenous volume of sectoral domestic sales; it applies to commodities in the set $cddexog(c)$ (see [cddexog01sim](#)). The counterfactual value for $q\bar{d}bar$ for commodity c in simulation sim in period t is computed as

$q\bar{d}bar(c,r,t) = q\bar{d}bar0(c,r,t)$ if $q\bar{d}barsim(sim,c,r,t) = 0$

$q\bar{d}bar(c,r,t) = q\bar{d}bar0(c,r,t)*q\bar{d}bar2sim(sim,c,r,t)$ if $q\bar{d}barsim(sim,c,r,t) <> 0$

qdbar2sim -- qdbar2sim(sim,c,t)

Domain: sim,c,t

Units: monetary; same units as SAM

Description: exogenous volume of sectoral domestic sales; it applies to commodities in the set $cddexog(c)$ (see [cddexog01sim](#)). The counterfactual value for $q\bar{d}bar$ for commodity c in simulation sim in period t is computed as

$q\bar{d}bar(c,r,t) = q\bar{d}bar0(c,r,t)$ if $q\bar{d}bar2sim(sim,c,r,t) = 0$

$q\bar{d}bar(c,r,t) = q\bar{d}bar0(c,r,t) + q\bar{d}bar2sim(sim,c,r,t)/scaling('samsol')$ if
 $q\bar{d}bar2sim(sim,c,r,t) <> 0$

qeqratsim -- qeqratsim(sim,c,t)

Domain: sim,c,t

Units: index

Description: ratio bt exports and domestic sales for commodity c in simulation sim and time period t .

5.5 Transfers

trnsfr01sim -- trnsfr01sim(sim,ac,ins,t)

Domain: sim,ac,ins,t

Units: 0,1

Description: selection (option 1) of domestic non-government institutions with endogenous transfers from government that are used to clear the government budget in simulation sim.

trnsfrbsim -- trnsfrbsim(sim,ac,ins,t)

Domain: sim,ac,ins,t

Units: index

Description: deviation relative to base for exogenous transfers such as (a) from the rest of the world to domestic institutions, (b) from the rest of the world to factors, and (c) from the government to the other (non-government) institutions. (Note that transfers from domestic non-government institutions are a fixed shared of their respective incomes.) The counterfactual transfer from institution ins to institution/factor ac in period t is computed as

$trnsfrb(ac,ins,t) = trnsfrb0(ac,ins,t)$ if $trnsfrbsim(sim,ac,ins,t) = 0$

$trnsfrb(ac,ins,t) = trnsfrb0(ac,ins,t) * trnsfrbsim(sim,ac,ins,t)$ if
 $trnsfrbsim(sim,ac,ins,t) \neq 0$

where ac can include institutions and/or factors of production.

dtrnsfrsim -- dtrnsfrsim(sim,ac,ins,t)

Domain: sim,ac,ins,t

Units: monetary; same units as SAM

Description: absolute change relative to base for exogenous transfers such as (a) from the rest of the world to domestic institutions, (b) from the rest of the world to factors, and (c) from the government to the other (non-government) institutions.

5.6 Investment

dkinsbsim -- dkinsbsim(sim,ins2,fcap,t)

Domain: sim,ins2,fcap,t

Units: index

Description: change in government (ins2=govz) or non-government (ins2=ngovz) real investment as deviations relative to base.

dkinsb2sim – *dkinsb2sim(sim,ins2,fcap,t)*

Domain: sim,acngovpay,t

Units: monetary; same units as SAM

Description: change in government (ins2=govz) or non-government (ins2=ngovz) real investment as levels.

ddkinssim -- *ddkinssim(sim,ins2,fcap,t)*

Domain: sim,ins2,fcap,t

Units: monetary; same units as SAM

Description: change in government (ins2=govz) or non-government (ins2=ngovz) real investment as absolute change.

fdisim -- *fdisim(sim,fcapng,t)*

Domain: sim,fcapng,t

Units: index

Description: FDI investment as deviation relative to the base.

fdi2sim -- *fdi2sim(sim,fcapng,t)*

Domain: sim,fcapng,t

Units: monetary; same units as SAM

Description: FDI investment as level.

iadj01sim -- *iadj01sim(sim,fcap)*

Domain: sim,fcap

Units: 0,1

Description: selection of elements in sim-fcap that will be considered endogenous in case private investment is the clearing variable for the savings-investment balance. By default, iadj01 is equal to one for all elements in the set fcapng.

mpcapgovsim -- mpcapgovsim(sim,fcap)

Domain: sim,a

Units: 0,1

Description: similar to [mpcapgovsim](#) but applied to simulation sim.

mtfpsim -- mtfpsim(sim,a,fcap)

Domain: sim,a

Units: 0,1

Description: similar to [mtfp](#) but applied to simulation sim.

5.7 Factor Productivity

tfpexogsim -- tfpexogsim(sim,a,t)

Domain: sim,a,t

Units: index

Description: sectoral total factor productivity (TFP) as deviation relative to base. In practice, the scale/shift parameter of the value added production functions is modified. The counterfactual TFP for activity a is computed as

$$\text{tfpexog}(a,t) = \text{tfpexog0}(a,t) \quad \text{if } \text{tfpexogsim}(\text{sim},a,t) = 0$$

$$\text{tfpexog}(a,t) = \text{tfpexog0}(a,t) * \text{tfpexogsim}(\text{sim},a,t) \quad \text{if } \text{tfpexogsim}(\text{sim},a,t) \neq 0$$

fprdbarsim -- fprdbarsim(sim,f,t)

Domain: sim,f,t

Units: index

Description: factor-specific productivity as deviation relative to base. The counterfactual value for fprdb for factor f in simulation sim is computed as

$$\text{fprdbar}(f,t) = \text{fprdbar0}(f,t) \quad \text{if } \text{fprdbarsim}(\text{sim},f,t) = 0$$

$$\text{fprdbar}(f,t) = \text{fprdbar0}(f,t) * \text{fprdbarsim}(\text{sim},f,t) \quad \text{if } \text{fprdbarsim}(\text{sim},f,t) \neq 0$$

fprdabarsim -- fprdbarsim(sim,f,a,t)

Domain: sim,f,a,t

Units: index

Description: factor- and activity-specific productivity as deviation relative to base. The counterfactual value for fprdb for factor f in simulation sim is computed as

$$\text{fprdb}(f,a,t) = \text{fprdb0}(f,a,t) \quad \text{if } \text{fprdabsim}(\text{sim},f,a,t) = 0$$

$$\text{fprdb}(f,a,t) = \text{fprdb0}(f,a,t) * \text{fprdabarsim}(\text{sim},f,a,t) \quad \text{if } \text{fprdabsim}(\text{sim},f,a,t) <> 0$$

5.8 Factor Supply

qfacgrwsim -- qfacgrwsim(sim,f,t)

Domain: sim,f,t

Units: index

Description: factor supplies as deviations with respect to the base. The next two examples show how to implement shocks for mobile and specific factors.

In order to implement a shock for a mobile factor,

$$\text{QFS}(f,t) = \text{QFS0}(f,t) \quad \text{if } \text{qfacgrwsim}(\text{sim},f,t) = 0$$

$$\text{QFS}(f,t) = \text{QFS0}(f,t) * \text{qfacgrwsim}(\text{sim},f,t) \quad \text{if } \text{qfacgrwsim}(\text{sim},f,t) <> 0$$

In order to implement a shock for a specific factor,

$$\text{QF}(f,a,t) = \text{QF0}(f,a,t) \quad \text{if } \text{qfacgrwsim}(\text{sim},f,t) = 0$$

$$\text{QF}(f,a,t) = \text{QF0}(f,a,t) * \text{qfacgrwsim}(\text{sim},f,t) \quad \text{if } \text{qfacgrwsim}(\text{sim},f,t) <> 0$$

5.9 Tourism

qtrstbsim – qtrstbsim(sim,c,instrst,t)

Domain: sim,c,instrst,t

Units: index

Description: foreign tourism spending as deviation relative to base.

qtrstb2sim – qtrstb2sim(sim,c,instrst,t)

Domain: sim,c,instrst,t

Units: monetary; same units as SAM

Description: foreign tourism spending as level.

5.10 Price Regulation

aregpa01sim -- aregpa01sim(sim,a)

Domain: sim,a

Units: 0,1

Description: similar to [aregpa010](#) but applied to simulation sim.

cregpds01sim -- cregpds01sim(sim,c)

Domain: sim,c

Units: 0,1

Description: similar to [cregpds010](#) but applied to simulation sim.

cregpqs01sim -- cregpqs01sim(sim,c)

Domain: sim,c

Units: 0,1

Description: similar to [cregpqs010](#) but applied to simulation sim.

cregpqd01sim -- cregpqd01sim(sim,c,d)

Domain: sim,c,d

Units: 0,1

Description: similar to [cregpqd010](#) but applied to simulation sim.

PAREALSIM -- PAREALSIM(sim,a,t)

Domain: sim,a,t

Units: index

Description: trajectory for the price of regulated activities. If left empty, the regulated price is equal to the price in the reference scenario.

PDSREALSIM -- PDSREALSIM(sim,c,t)

Domain: sim,c,t

Units: index

Description: trajectory for the price of regulated commodities. If left empty, the regulated price is equal to the price in the reference scenario.

PQSREALSIM -- PQSREALSIM(sim,c,t)

Domain: sim,c,t

Units: index

Description: trajectory for the price of regulated commodities. If left empty, the regulated price is equal to the price in the reference scenario.

PQDREALSIM -- PQDREALSIM(sim,c,ac,t)

Domain: sim,c,t

Units: index

Description: trajectory for the price of regulated commodities. If left empty, the regulated price is equal to the price in the reference scenario.

5.11 Foreign Financing

nffngbsim -- nffngbsim(sim,t)

Domain: sim,t

Units: index

Description: net foreign financing for domestic non-government institutions (FCU) as deviation relative to base.

nffngb2sim -- nffngb2sim(sim,t)

Domain: sim,t

Units: monetary; same units as SAM

Description: net foreign financing for domestic non-government institutions (FCU) as level.

NFFGSIM -- NFFGSIM(sim,t)

Domain: sim,t

Units: index

Description: government net foreign financing (difference between net foreign borrowing and interest payments) (FCU) as deviation relative to base.

5.12 Deforestation

qdeforbsim -- qdeforbsim(sim,t)

Domain: sim,t

Units: index

Description: deforestation as deviation relative to base.

qdeforb2sim -- qdeforb2sim(sim,t)

Domain: sim,t

Units: physical; same units as qfor0

Description: deforestation as level.

5.13 Other

qgbsim – qgbsim(sim,c,t)

Domain: sim,c,t

Units: index

Description: government consumption/provision of goods and services as deviation relative to base.

qg2bsim – qgbsim(sim,c,t)

Domain: sim,c,t

Units: index

Description: government consumption/provision of goods and services as level.

icasim – icasim(sim,c,a,t)

Domain: sim,c,a,t

Units: index

Description: input-output coefficient as deviation relative to base; the non-base intermediate input c per unit of aggregate intermediate in simulation sim is computed as

$$ica(c,a,t) = ica0(c,a,t) \quad \text{if } icasim(sim,c,a,t) = 0$$

$$ica(c,a,t) = ica0(c,a,t)*icasim(sim,c,a,t) \quad \text{if } icasim(sim,c,a,t) \neq 0$$

CPISIM – CPISIM(sim,t)

Domain: sim,t

Units: index

Description: numeraire as deviation relative to base. In general, this sheet can be used to check that the model is homogenous of degree zero in prices. In other words, if the numeraire is doubled, all nominal variables (i.e., prices and incomes) should be doubled and quantities remain constant. The counterfactual CPI is defined as

$$CPI(t) = CPI0(t) \quad \text{if } CPISIM(sim,t) = 0$$

$$CPI(t) = CPI0(t) * CPISIM(sim,t) \quad \text{if } CPISIM(sim,t) \neq 0$$

qheffsim -- qheffsim(sim,c,h,t)

Domain: sim,c,h,t

Units: index

Description: commodity and household-specific consumption efficiency parameter as relative deviation relative to base.

layout

In this sheet, we define how the information in the Excel file is organized. In general, the user should not modify this sheet.

6. Report Files

The report files (i.e., rep1-disp-gdx.gdx and report.gdx) are generated after executing the file sim.gms. Specifically, the reporting files contain: (i) all endogenous variables (variable name + X); (ii) the percentage change relative to the base for all endogenous variables (variable name + XP); (iii) the annual average growth rate for all endogenous variables (variable name + XPP); (iv) parameters used to define counterfactual scenarios (parameter name + X), and; (v) additional report parameters computed based on model results that are described next.

- `modsolstat(solcol,t,sim)`: status of solver and model; given that the model is solved as a CNS (constrained non-linear system) problem, the solver and model status should be 1 and 16, respectively. Otherwise, an error has occurred.
- `SIMSAM(ac,acp,t,sim)`: is a collection of SAMs defined using results from each of the simulations contained in the `simcur` set.
- `simsambalchk(ac,t,sim)`: is a report parameter that allows checking if the SIMSAM accounts are balanced.
- `MACROSAM(ac2,ac2p,t,sim)`: contains an aggregated (macro) SAM for each of the simulation scenarios.
- `macrosambalchk(ac2,t,sim)`: is a report parameter that allows checking if the MACROSAM accounts are balanced.
- `gdpindic(igdp,kgdp,t,sim)`: summary table with GDP and its components, both in nominal and real terms; in absolute values and as shares of GDP.
- `gdpindicXP(igdp,kgdp,t,sim)`: similar to the previous one but shows percentage changes relative to the base scenario.
- `sectorstruc(ac,sectorcol,t,sim)`: this report parameter described the sectoral structure of the economy, both in terms of production and foreign trade. For example, it contains the share of each commodity in total exports, the share of each commodity in total, the share of imports in total consumption, and the share of exports in the total output.
- `sectorindic(ac,sectorcol2,kgdp,t,sim)`: this report parameter also describes the sectoral structure of the economy, both in terms of production and foreign trade; unlike the previous one, it presents information in absolute values. In turn, the `sectorindicXP` parameter presents the results as percentage changes from the base scenario.
- `fiscalindic(fiscalcol,t,sim)`: this report parameter shows the government budget. For example, it shows the ratio between government savings and GDP, the ratio between tax collection and GDP, among others.
- `taxstruc(ac,taxcol,t,sim)`: this report parameter shows information regarding the tax collection, in values, as a share of total tax collection, and as a share of GDP..

- `bopindic(bopcol,kgdp,t,sim)`: this report parameter shows the current account of the balance of payments, in domestic currency, as a share of GDP, and in foreign currency.
- `actvashr(a,t,sim)`: this report shows the share of each activity in total value added.
- `ev(h,t,sim)`: is the equivalent variation.
- `cv(h,t,sim)`: is the compensatory variation.
- `elestruc(ac,elec1,t,sim)`: this report parameter summarizes the structure of the electricity sector.
- `demstruc(kgdp,ac,demcol,t,sim)`: this report shows the demand structure (i.e., intermediate/final) for each commodity in the SAM.
- `incomestruc (incdistcol,ac,ac,t,sim)`: this report shows the sources of income by institution, including taxes for government and imports for rest of the world.

The reports that are expressed in the local currency unit are scaled – using the information in the scaling sheet -- to the original units in the SAM. The model can be used through ISIM, in which case some Excel reports are generated.

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