

**ISIM:**  
**A User-Friendly Interface for Computable  
General Equilibrium Models**

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## 1. Introduction

The skills required to make productive use of Computable General Equilibrium (CGE) models in policy analysis are considerable, inter alia including strength in economics, modeling, and a variety of software. The objective of ISIM, a user-friendly interface for CGE models, is to reduce the skills required in terms of modeling and software, permitting the analyst to focus on policy and economics, thereby making CGE-based policy analysis more cost-effective.<sup>1</sup> The analyst who uses the interface works exclusively in an Excel environment and receives substantial guidance throughout the analytical process. Knowledge of GAMS (the software in which CGE models developed by the authors are coded) and an editor (GAMSIDE, GAMS Studio, or other) is no longer needed. This note briefly describes the structure of ISIM, how users at different skill levels may use it and interact with it, and the major steps involved in a typical application with a pre-defined data set. It is aimed at practitioners interested in applying the CGE modeling framework. To illustrate, we use a simple CGE model.

## 2. Overview of the interface

ISIM was developed using as an add-on for Excel 2007, later updated to also work with all newer Excel versions. The user is required to work in a current Windows environment and to have Excel 2010 or newer and GAMS installed on the computer.<sup>2</sup> The reason for using Excel as the front-end is that the Excel environment is familiar to most analysts, removing the initial barrier for users to start working with ISIM.

ISIM might be used with various models – including MAMS (Lofgren et al. 2013), GEM-Core (Cicowiez and Lofgren (2017), GEM-Care (Lofgren and Cicowiez 2018), among others -- and data sets defined by country and year. (Generally speaking, these data sets are easier to develop using GAMS and Excel without the interface.) Most users of ISIM are expected to do policy analysis using one or more applications, each of which is associated with an existing

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<sup>1</sup> ISIM was originally developed as ISIM-MAMS, an interface for MAMS (see Lofgren et al. 2013). Reducing the skills required to develop and apply economic models was also a major reason behind the initial development of GAMS (Bussieck and Meeraus 2003, p. 138). The RunGTAP software for the GTAP model was developed with the same objective (Pearson and Horridge 2005).

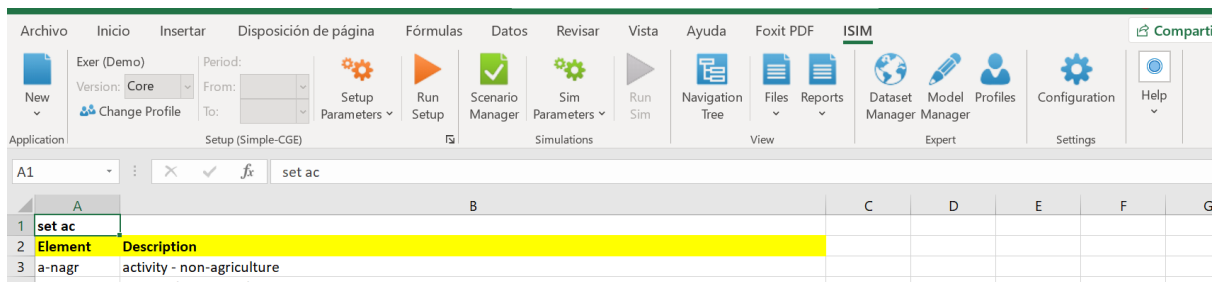
<sup>2</sup> One drawback of relying on Excel is that reprogramming of parts of ISIM was required to maintain compatibility across different Excel versions.

data set and includes a pre-programmed reference scenario. However, advanced users may also develop a database and a reference scenario working in GAMS and, after reading in the database as a new data set for ISIM (using its *expert features*), shift to ISIM for policy analysis, perhaps collaborating with a broader group of analysts. The aim is that every user, irrespective of background, should find it more convenient to carry out the policy analysis step in ISIM rather than using the traditional GAMS alternative.

Assuming that GAMS and Excel 2010 or newer are already installed on the user's computer, the first step is to install ISIM, which comes in the form of an .exe file that, when executed, runs a standard installation routine. After installation, Excel has a new tab called ISIM that, when selected, opens an intuitive interface ribbon with user-friendly buttons. To run ISIM for an application (once defined), the user simply has to click on the *Run Sim* button on the ISIM ribbon. The ISIM interface is connected to a database that, for each data set, stores definitions of sets (including commodities, activities, factors, and institutions) and parameters (including default elasticities, closure and rules/policies) that are used to define scenarios. The rest of the relevant country data set (other than the application database) is stored in the ISIM installation folder, mostly in GDX and Excel files.

Assuming that the user is satisfied to work with one of the existing data sets, the next steps are to: (1) open Excel 2010 or newer; (2) select the ISIM tab (see Figure 2.1); (3) create a new application and associate it with one of the available data sets; (4) run and optionally modify the pre-defined reference scenario; (5) define and run additional scenarios such as "base" (that may be identical to the reference scenario) and, most likely, other scenarios of interest; and (6) access the results inside the same Excel file, presented in tables and graphs. Throughout the process, parameters and other items are hyperlinked to relevant segments in the selected CGE model user guide, which is included with ISIM. Each application resides in an Excel file (named by the user) that can be used by others who have ISIM installed.

**Figure 2.1. The ISIM ribbon and navigation tree**

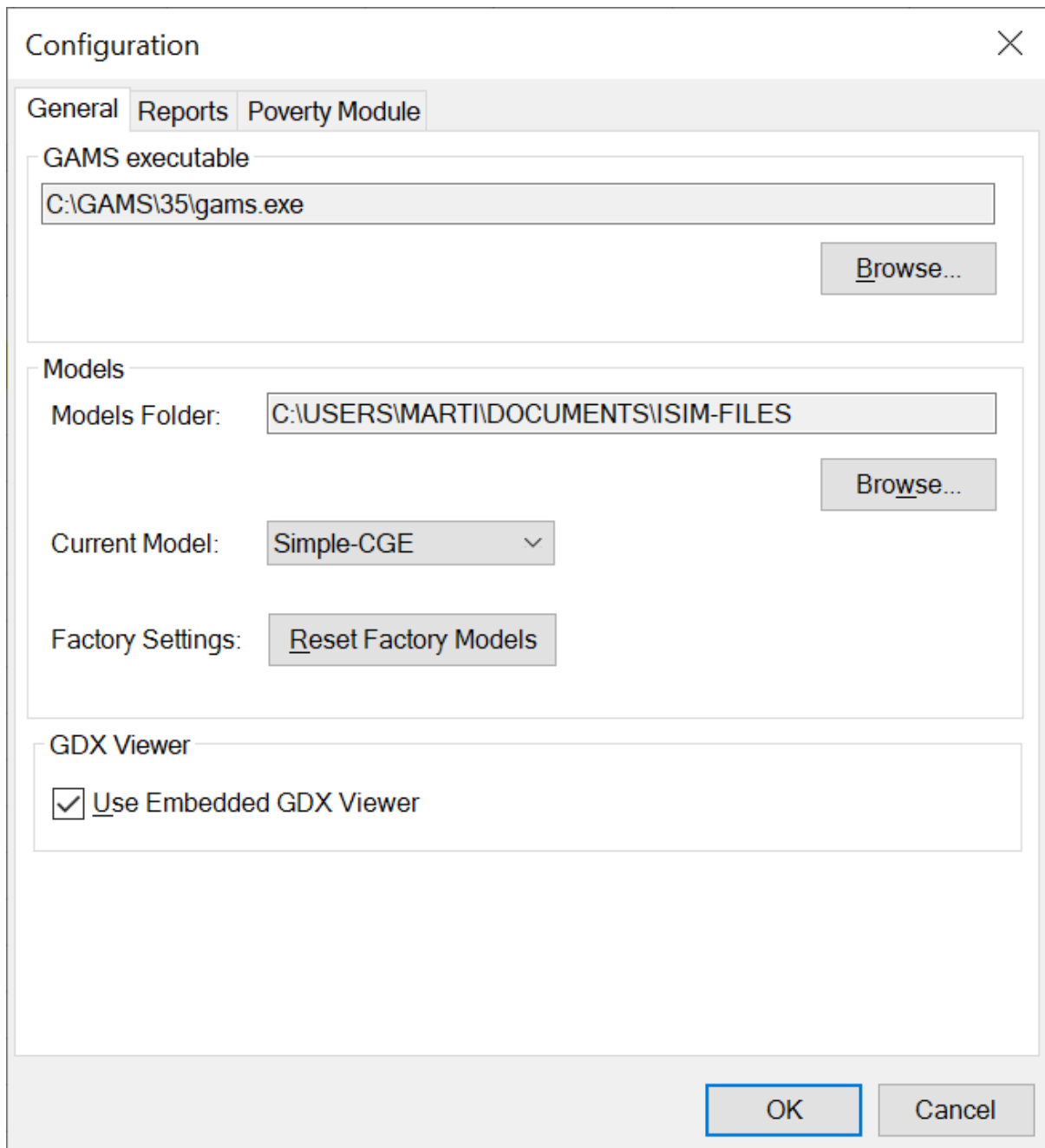


## 3. Using ISIM

### 3.1. Selection of current model

To select the Simple CGE model, click on Settings | Configuration and select “Simple CGE” as the Current Model (Figure 3.1).

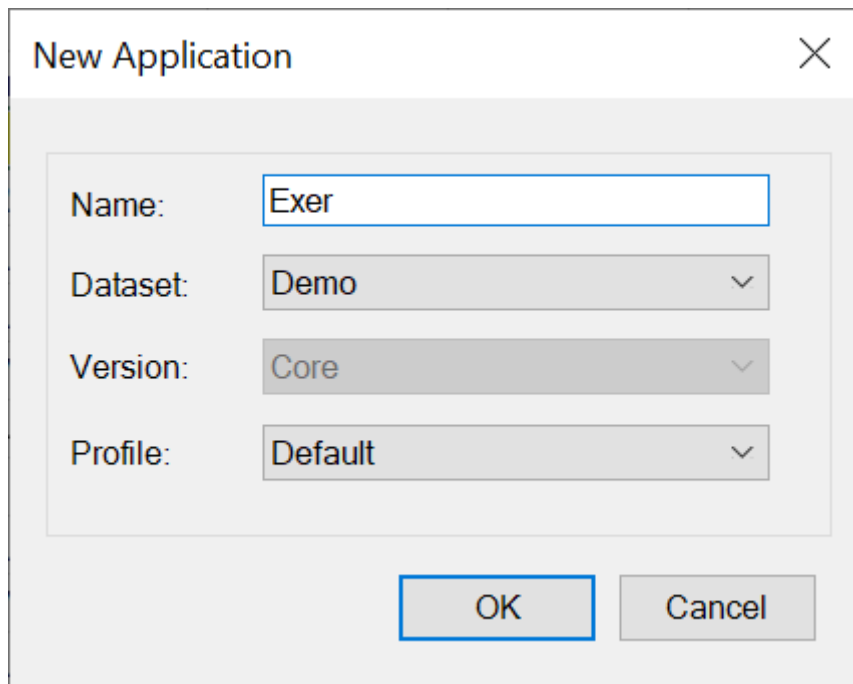
Figure 3.1. Model selection



### 3.2. Selection of database and model version

This section shows how to create an ISIM application named “Exer” based on the “Demo” data set and using the Simple CGE model (see Figure 3.2). ISIM will load into Excel the data needed to define scenarios for the selected application, including the elements in the sets that are used to define shocks. (To exemplify, among the loaded data, elements in the set of commodities may be used to define commodity tax rates.)

Figure 3.2. New application dialog box



The image shows a 'New Application' dialog box. It has a title bar with the text 'New Application' and a close button (X). The dialog contains four input fields: 'Name' with the text 'Exer', 'Dataset' with 'Demo', 'Version' with 'Core', and 'Profile' with 'Default'. At the bottom are 'OK' and 'Cancel' buttons.

ISIM permits changes in application databases. For example, a user can change data like elasticities and, depending on the selected model, closures and rules. To facilitate the navigation across the different sections of the Excel file, the user can click on elements of interest within the *Navigation Tree* (see Figure 2.1).

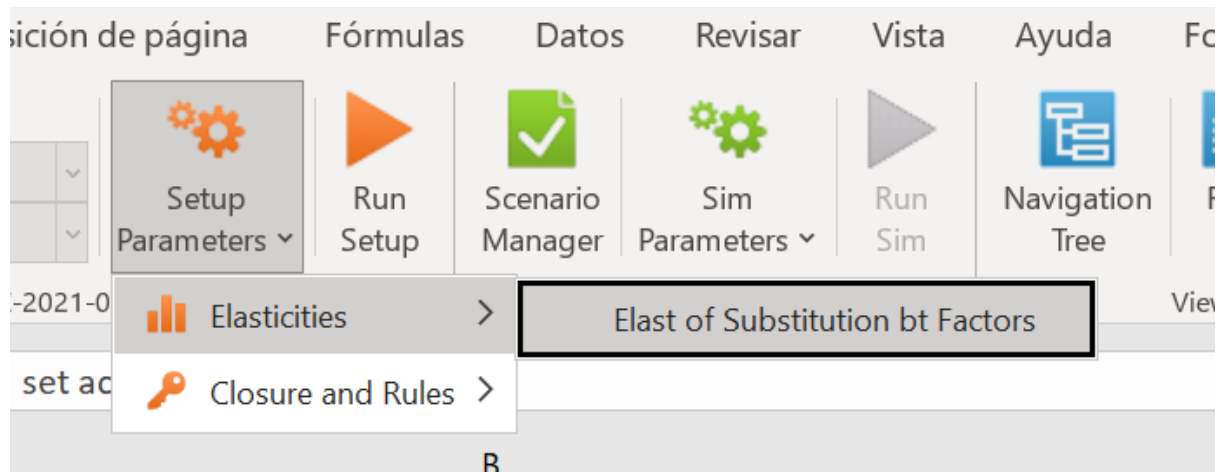
In addition, (advanced) users can create application databases; i.e., adding new country data sets to ISIM. They may also change other aspects of the Simple CGE or any other CGE model in ISIM by editing relevant GAMS and/or Excel files in the ISIM installation folders, using Excel and a text editor.

### 3.3. The reference scenario

The first step in performing counterfactual simulations with ISIM and Simple CGE is the construction of a (static) base scenario and model calibration. To help the user carry out this task, ISIM includes, for each dataset, a pre-defined reference scenario. Key parameters of this scenario can be changed inside ISIM, including all model elasticities. To exemplify, Figures 3.3a and 3.3b demonstrate how the analyst can change the elasticities of substitution between primary factors of production; the default values can always be restored by clicking *Restore*

defaults. Once defined, the reference scenario is run by clicking the *Run Setup* button; ISIM will automatically call on GAMS to run Simple CGE.

**Figure 3.3.a. Changing the elasticities of substitution between factors of production**



**Figure 3.3.b. Changing the elasticity of substitution between factors of production – cont.**

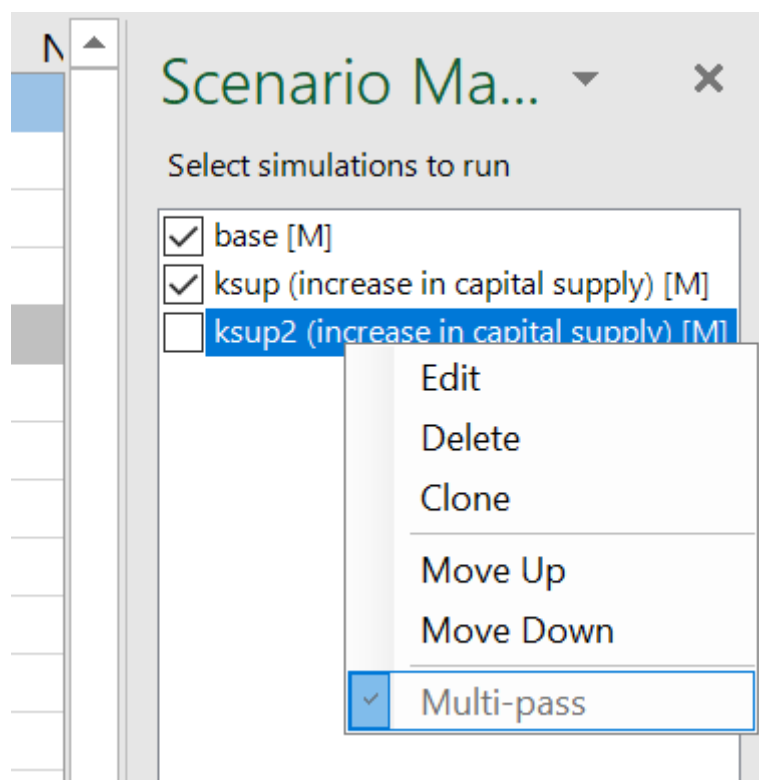
	A	B	C
1	<b>prodelas(a)</b>		
2	a		<b>value</b>
3	a-agr		1
4	a-nagr		1
5	<a href="#">Restore defaults</a>		
6			

### 3.4. Defining and running scenarios

By default, ISIM generates a scenario called *base*. The user defines additional scenarios and introduce policy changes and exogenous shocks, including changes in taxation, public spending and its allocation, factor endowments, among others. All the defined counterfactual scenarios are saved in the ISIM application-specific Excel file. The types of changes that are permitted relative to the reference scenario reflect what seemed relevant in light of experience from a large number of CGE applications. The interface validates the input from the user to reduce the likelihood that simulations will fail to run without error.

To create a new simulation or delete an existing one, the user clicks on the *Scenario Manager* button, opening the window shown in Figure 3.4. By clicking or unclicking the box in front of each scenario, the user decides which simulations to run (there is no need to run all the defined scenarios). By right-clicking above any scenario, the user can edit the name and the explanatory text, delete, clone, and change the solution order of the simulation. In the example, the simulation *ksup* will be run, while *ksup-2* will not. The elements under *Shocks* and *Closure and Rules* in the *Navigation Tree* show what can be changed in the definition of the non-reference scenarios. If no changes are made for a scenario, then it is identical to the reference scenario. In order for the base scenario to function as the benchmark to which other scenarios are compared, it may be preferable to leave it unchanged (i.e., identical to the reference scenario).

**Figure 3.4. Scenario manager**



More specifically, for the base and other simulations created by the user, changes can be made in items, grouped into the following categories:

- factor endowments: changes in the households' factor endowments;
- government: changes in (1) indirect tax rates, and (2) direct tax rates; and



- production functions: changes in (1) TFP by activity, and (2) input-output coefficients.

Needless to say, other CGE models consider a much broader set of Simulation Parameters. As an example, Figure 3.4 shows how to define a 50 percent increase in the capital supply; the other shocks can be similarly defined.

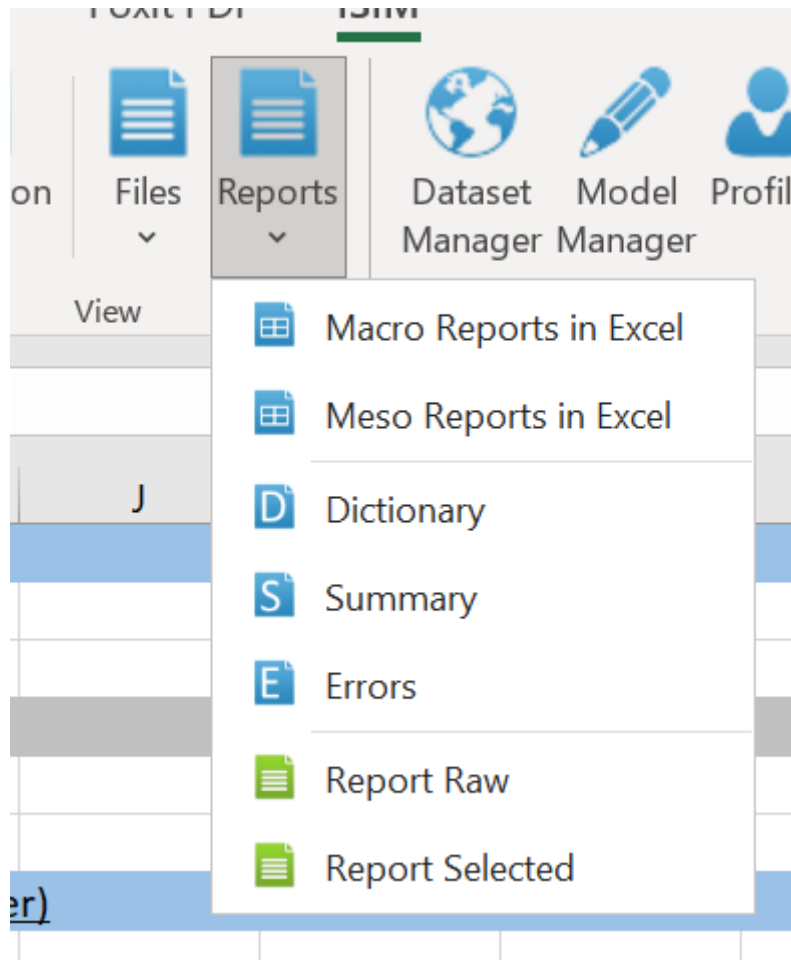
Figure 3.5. Defining a shock to the capital supply

	A	B	C	D	E
3	QFSSIM(sim,f)				supply
4	sim		f	value	
5	X ksup		f-cap	1.5	
6	<a href="#">Add row</a>				
7					

### 3.6. Review and further processing of simulation results

Once the selected scenarios have been run with success, results can be accessed via the ISIM interface by clicking on the button Reports in the View group of the ISIM ribbon (see Figure 3.7). ISIM generates reports with base-year data, macro results, and meso results through tables in the GAMS GDX format accessible through the embedded GDX Viewer (see Figure 3.8). In addition, ISIM provides raw reports also available through View | Reports (see file report.gdx).

Figure 3.6. Accessing results



**Figure 3.7. Simple CGE results viewed using the embedded GDV Viewer**

The screenshot shows the 'gdp table' in the GDV Viewer. The table is filtered by 'sim' and 'kgdp'. The columns are 'Nominal', 'Real', 'GDPshr', and 'GDPshr-Real'. The rows are 'PrvCon', 'GDPMP', 'GDPMP\_alt', and 'GDPFC'. The values are as follows:

	Nominal	Real	GDPshr	GDPshr-Real
PrvCon	26.190	26.290	0.000	
GDPMP	26.190	26.290	0.000	
GDPMP_alt	26.190		0.000	
GDPFC	26.190	28.727	0.000	1.930

### 3.6. Input validation and error messages

Before calling GAMS to run the selected simulations, ISIM validates the definition of shocks, elasticities, and/or closures and rules. In case errors are found, messages appear in pop-up windows and the user will have to check the red Excel cells, located in the sheets whose labels also turned to red. Besides, an error summary sheet shows the list of generated validation errors. In case the solution of ISIM ends with an error, the user is offered the chance to inspect the ISIM log file or the GAMS listing file. The log and listing file viewer allows the user to navigate through the ISIM and/or GAMS errors. The log file is intended for users with no GAMS knowledge. On the other hand, the GAMS listing file provides the raw GAMS results and error messages. In case Simple CGE --or any other model within ISIM -- is successfully solved, ISIM will add or update the report files.