Defining and Running Counterfactual Scenarios Using ISIM-MAMS*

This material was prepared by Martín Cicowiez (CEDLAS-UNLP) and Marco V. Sánchez (UN-DESA) for the First Intensive Training Workshop of the Project "Strengthening Macro-Micro Modeling Capacities to Assess Development Support Measures and Strategies", Entebbe, March 7-9, 2012, which has been organized by UNDP Uganda, the Ministry of Finance Planning and Economic Development (MOFPED) and UN-DESA.

1. Exogenous Policy and External Shocks Simulations

In this session, we will show, step by step, how to define and run four counterfactual scenarios related to exogenous policy and external shocks using ISIM-MAMS with the Uganda 2009/10 dataset (updated as of March 2012). In order to implement the following examples, the reader should have successfully installed ISIM-MAMS.

Example 1: Increase in the world export price of food products during 2011-2015

In this first example, we will start by creating the ISIM-MAMS application file that will be used throughout the remaining of the workshop (see steps 1-3). Then, we will define and run a scenario that simulates a 50% increase in the world export price of food during 2011/12-2015/16.

1. Open Excel.
2. Click on the ISIM-MAMS tab; it automatically opens a ribbon with MAMS-specific buttons.
3. Click on **New** in the **Application** ribbon group (Figure 1.1). Then,

    1. Introduce the name Test for the new MAMS application.
    2. Select the Uganda0910 dataset.
    3. Select the MDG version of MAMS (Figure 1.2).

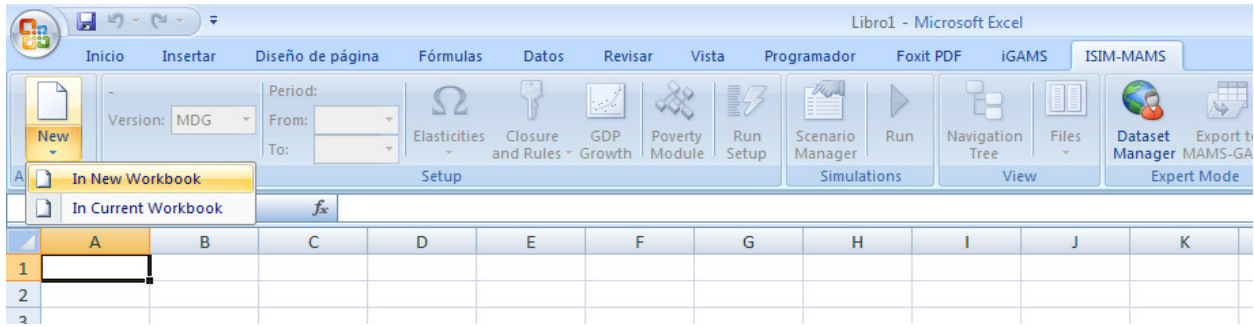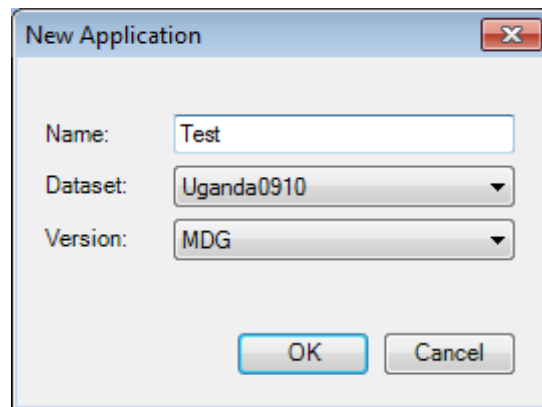*Figure 1.1: Create a New ISIM-MAMS Application 1*

Figure 1.2: Create a New ISIM-MAMS Application 2

4. Run the pre-programmed reference scenario by clicking on **Run Setup** in the **Setup** ribbon group. MAMS will be run and a window will show the progress in running MAMS (Figure 1.3). Tip: you may like to check what closure and rules are being used in order to understand the results generated for this pre-programmed reference scenario (it is important to do so, as this is the benchmark taken for all other simulations!).

Figure 1.3: Running Model Setup
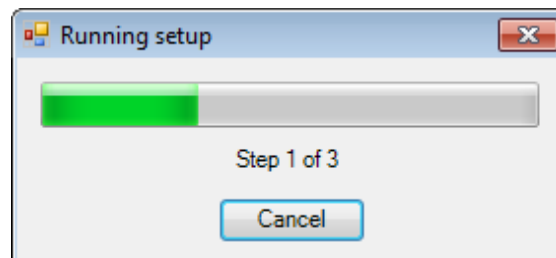
5. Open the **Scenario Manager** by clicking on **Scenario Manager** in the **Simulations** ribbon group. Then, click on **New simulation** to create a new simulation. In the window that shows up (Figure 1.4),

1. Introduce "pwefood" (i.e., the name we want to give to this example simulation) in the **Name** field.
2. Introduce a short description in the **Description** field, which is good to associate the simulation with the change eventually imposed.
3. Keep the Multi-pass default in the **Mode** field. Once finished, click OK. The newly created simulation will be added to the **Scenario Manager** (Figure 1.5).

Figure 1.4: Defining the New Simulation
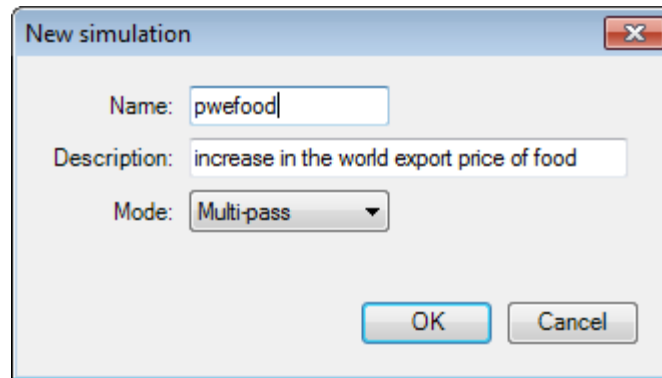
Figure 1.5: Scenario Manager
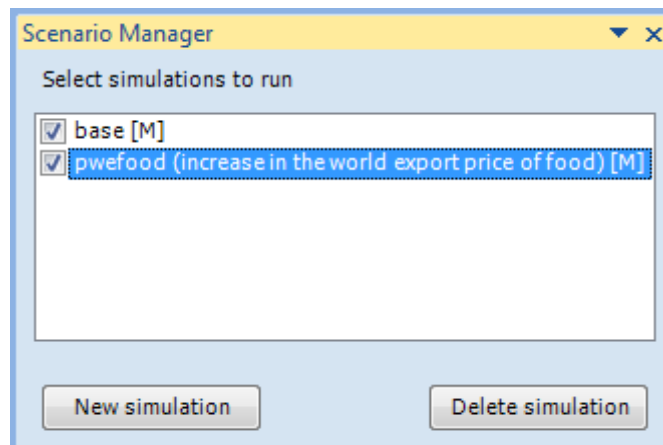
6. Go to the **pwesim** section in the **external-shocks** sheet. Note that the **Navigation Tree** can be used to move across the Excel file (Figure 1.6); to access the **Navigation Tree**, click on the corresponding icon on the **View** ribbon group. To define the counterfactual scenario,

1. In column sim (i.e., simulation), use the drop-down menu to select pwefood (i.e., the name that had been given to the simulation).

2. In column c (i.e., commodity), use the drop-down menu to select one of the agricultural commodities – see the ***dictionary*** sheet in order to identify the agricultural commodities in the Uganda 2009/10 SAM.

3. Click on Add row to add a new row to the ***pwesim*** shock parameter and then select one of the remainder agricultural commodities; repeat this step until all 18 agricultural commodities that are part of the Uganda dataset are included as part of the pwefood simulation (c-maize, c-rice, c-wheat, c-cassava, c-potato, c-cotton, c-tobacco, c-beans, c-flowers, c-coffee, c-tea, c-matoke, c-othagr, c-livestock, c-fish, c-othfood, c-coffeeproc, c-teaproc).[1]

4. In columns 2009-2010, introduce number 1 (i.e., keep the base year value) for all the selected agricultural commodities (Figure 1.6). Notice that the default simulation period for the Uganda0910 dataset is 2009/10-2015/16, with 2009/10 being the base year.

5. In columns 2011-2015, introduce 1.25 (i.e., the equivalent to 25% in the ISIM-MAMS setting) for all the selected agricultural commodities.

Figure 1.6: Navigation Tree and Defining Shocks to the World Price of Exports

7. Run the selected simulations by clicking on ***Run*** in the ***Simulations*** ribbon group. Again, a window will show the progress in running MAMS.

8. Once finished, new sheets with reports will be added to the Excel file. The user can access the results through macro and meso reports, the dashboard, and a pivot table (Figure 1.7). Note that the ***repmacro-contents*** and ***repmeso-contents*** sheets can be used to navigate across the report tables.

9. Analyze the macro and meso results. Specifically, review the following results: macro aggregates, real exchange rate, government budget, sectoral structure of production and trade, and MDG indicators. Once finished, you can save the ISIM-MAMS application Excel file by following the Excel

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[1] In reality, the simulation of a world price should affect both the export price and the import price of the commodity if this commodity is both exported and imported. Up to this point, we want to simulate a shock in the world export price only. In the two subsequent examples, we respectively shock the world import price only (example 2) and both world export and import prices (example 3). Simulating separately the shocks in world export and import prices for a commodity that is both exported and imported allows a better understanding of the results of a shock when both prices are changed simultaneously (where there is also interaction effects from changing both prices).

usual procedure (i.e., go to File | Save). Note that an ISIM-MAMS application Excel file is always associated with a country-specific dataset.

Figure 1.7: Report Example

	A	B	C
2	Macro Report Contents		
3	Table. Real macro indicators by simulation (% annual growth from first to final report y		
4			Final year
5	Indicator	2009	base
6	Absorption	39015.19	5.58
7	Consumption - private	27527.64	4.72
8	Consumption - government	3342.42	8.37
9	Fixed investment - private	6143.28	5.79
10	Fixed investment - government	1901.57	11.76
11	Stock change	100.29	Eps
12	Exports	7165.26	8.81
13	Imports	11568.32	5.69

Example 2: Increase in the world import price of agricultural products

In this example, we start from the last step of example 1. Thus, there is no need to create a new ISIM-MAMS application Excel file and/or run the pre-programmed reference scenario.

1. Open the **Scenario Manager** by clicking on **Scenario Manager** in the **Simulations** ribbon group. Then, click on **New simulation** to create a new simulation. In the window that shows up,

   1. Introduce "pwmfood" to stand for the name of this new simulation in the **Name** field.
   2. Introduce a short description in the **Description** field.
   3. Keep the Multi-pass default in the **Mode** field. Once finished, click OK. The newly created simulation will be added to the **Scenario Manager**.

2. Go to the **pwmsim** section in the **external-shocks** sheet. To define the counterfactual scenario, follow steps 6.1-6.5 of the previous example but using the **pwmsim** shock parameter and the pwmfood simulation. Note that you can copy the list of food commodities from the definition of the **pwesim** shock parameter used in the previous example.
3. Run the selected simulations by clicking on **Run** in the **Simulations** ribbon group. Again, a window will show the progress in running MAMS.
4. Once finished, the report sheet will be updated, including results for simulations pwefood and pwmfood, and the file can be saved.
5. Analyze the macro and meso results; specifically, review the following results: macro aggregates, real exchange rate, government budget, sectoral structure of production and trade, and MDG indicators.

Example 3: Increase in the world price of agricultural products

In this example, we will simulate a new scenario that combines the previous two scenarios, pwefood and pwmfood. Having performed the previous two exercises successfully, one should be able to perform this third exercise without following any instructions! The Real Macro indicators for each simulation should look like in Figure 1.8 before changing assumptions associated with the government closure rule.

Figure 1.8: Simulation results for pwefood, pwmfood, and pwfood

Macro Report Contents					
Table. Real macro indicators by simulation (% annual growth from first to final report year)					
		Final year			
Indicator	2009	base	pwefood	pwmfood	pwfood
Absorption	39002.80	5.78	7.25	5.57	7.06
Consumption - private	27516.18	5.38	6.76	5.11	6.51
Consumption - government	3339.69	7.53	8.50	7.42	8.42
Fixed investment - private	6144.39	6.29	8.39	6.24	8.35
Fixed investment - government	1902.23	7.60	9.15	7.50	9.09
Stock change	100.31	Eps	Eps	Eps	Eps
Exports	7168.11	9.26	7.96	9.32	8.05
Imports	11574.89	6.11	8.58	5.73	8.19
GDP at factor cost	31790.58	6.50	7.03	6.43	6.98
Total factor employment (index)	Eps	4.59	5.16	4.53	5.12
Total factor productivity (index)	Eps	1.91	1.87	1.90	1.86
Real exchange rate (index)	Eps	0.14	-3.49	0.16	-3.46
Headcount poverty rate (%)		Eps	Eps	Eps	Eps
1. Unless otherwise noted, column for initial year shows data in LCU.					

Example 4: Increase in Remittances

In this example, we will simulate a 50% increase in remittances (i.e., transfers from the rest of the world to households) during 2011/12-2015/16. In addition, we will also review the assumptions made to generate the pre-programmed reference scenario.

1. Open the **Scenario Manager** by clicking on **Scenario Manager** in the **Simulations** ribbon group. Then, click on **New simulation** to create a new simulation. In the window that shows up,

    1. Introduce "trhhdrow" to stand for the name of this new simulation in the **Name** field.
    1. Introduce a short description in the **Description** field.
    2. Keep the Multi-pass default for the **Mode** field. Once finished, click OK. The newly created simulation will be added to the Scenario Manager.

In the next steps, we will change some of the assumptions made to generate the pre-programmed reference scenario.

2. Go to the *siclossim* section in the *closure-and-rules* sheet to change the saving-investment. Then,

   1. In column sim, select trhhdrow.
   2. In column 2009, select 1 (can you explain the meaning of option 1?); note that option 1 will be applied to the whole simulation period.

3. Go to the *govclossim* section in the *closure-and-rules* sheet to change the government closure. Then,

   3. In column sim, select trhhdrow.
   4. In column 2009, select 5 (can you explain the meaning of option 5?).

4. Go to the *govspndrulesim* section in the *closure-and-rules* sheet to change the rule for the government spending items (see Figure 1.9). Then,

   1. In column sim, select trhhdrow.
   2. In column ac, select c-edupgov.
   3. In column 2009, select 1 so that government spending in primary education is kept fixed at reference scenario values.
   4. Add rows to repeat steps 2-3 above for the rest of the commodities consumed by the government (i.e., c-edusgov, c-edutgov, c-healthgov, c-wtsn, c-oinf, and c-publicadm).

Figure 1.9: Selecting Rules for Government Spending Items

	A	B	C	D	E	F	G
58	govspndrulesim(sim,ac,t1)				rule for government spending on ac		
59	sim	ac	2009	2010	2011	2012
60	X trhhdrow	c-edupgov	1			
61	X trhhdrow	c-edusgov	1			
62	X trhhdrow	c-edutgov	1			
63	X trhhdrow	c-healthgov	1			
64	X trhhdrow	c-wtsn	1			
65	X trhhdrow	c-oinf	1			
66	X trhhdrow	c-publicadm	1			
67	Add row					

5. Go to the *govrecrulesim* section in the *closure-and-rules* sheet to change the rule for the government receipts items. Then,

   1. In column sim, select trhhdrow.
   5. In column ac, select gborz.
   6. In column 2009, select 1 so that government domestic borrowing generating interest-bearing debt is kept fixed at reference scenario values.
   7. Click on *Add row*.

2. On the new row, in column sim, select trhhdrow.
8. On the new row, in column ac, select gbormsz.
9. On the new row, in column 2009, select 1 so that government domestic borrowing via the monetary system (i.e., non-generating interest-bearing debt) is kept fixed at reference scenario values.
10. Click on **Add row**.
11. On the new row, in column sim, select trhhdrow.
12. On the new row, in column ac, select fborgov.
13. On the new row, in column 2009, select 1.
14. Click on **Add row**.
15. On the new row, in column sim, select trhhdrow.
16. On the new row, in column ac, select trgovrow.
17. On the new row, in column 2009, select 1.

6. Go to the **ngovpayrulesim** section in the **closure-and-rules** sheet to change the rules for the different non-government payments (see Figure 1.10). Then,

1. In column sim, select trhhdrow.
2. In column ac, select trngovrow (aggregate transfers to non-government institutions from rest of world).
3. In column 2009, select 1 so that the **trnsfrpcsim** shock parameter can be used to define the counterfactual increase in remittances.
4. Add rows to repeat steps 2-3 above for the following non-government payments: trfacrow (aggregate transfers to factors from the rest of the world), fborngov (aggregate non-government borrowing from the rest of the world), and fdiz (foreign direct investment). Doing this, this set of non-government payments will be kept fixed at reference scenario values.

Figure 1.10: Selecting Rules for Non-Government Payments

	A	B	C	D	E	F	G
88	ngovpayrulesim(sim,ac,t1)			rule for non-government payment ac			
89	sim	ac		2009	2010	2011	2012
90	X trhhdrow	trngovrow		1			
91	X trhhdrow	trfacrow		1			
92	X trhhdrow	fborngov		1			
93	X trhhdrow	fdiz		1			
94	Add row						
95							

7. Go to the **trnsfrpcsim** section in the **trnsfr-shocks** sheet (Figure 1.11). To define the counterfactual scenario,

1. In column sim, select trhhdrow.

2. In column h (i.e., households), select hhd – note that the current version of the Uganda 2009/10 SAM identifies only one household.
3. In columns 2009-2010, introduce 1 (i.e., keep the base year value).
4. In columns 2011-2015, introduce 1.5 so that remittances per capita are increased by 50% relative to the reference scenario values.

Figure 1.11: Defining Shocks to Per-Capita Transfers to Households

	A	B	C	D	E	F	G	H	I	J	K	L
7		trnsfrpcsim(sim,h,insp,t1)			per-capita transfers to hh (households) from institution insp							
8		sim	h	insp	2009	2010	2011	2012	2013	2014	2015	
9	X	trhhdrow	hhd	row	1	1	1.5	1.5	1.5	1.5	1.5	
10		Add row										

8. Run the new simulation by clicking on **Run** in the **Simulations** ribbon group.
9. As before, the report sheets will be overwritten with the new set of results. As an example, some results are shown in Table 1.1.

Table 1.1: Simulation Results for trhhdrow; real macro indicators by simulation (% annual growth from first to final report year)

		Final year	
Indicator	2009	base	trhhdrow
Absorption	39,003	5.78	6.12
Consumption - private	27,516	5.38	5.77
Consumption - government	3,340	7.53	7.53
Fixed investment - private	6,144	6.29	6.66
Fixed investment - government	1,902	7.60	7.62
Stock change	100	0.00	0.00
Exports	7,168	9.26	8.39
Imports	11,575	6.11	6.34
GDP at factor cost	31,791	6.50	6.57
Total factor employment (index)		4.59	4.64
Total factor productivity (index)		1.91	1.93
Real exchange rate (index)		0.14	0.07

Table 1.2: Simulation Results for trhhdrow; government receipts and spending in first report year and by simulation in final report year (% of nominal GDP)

Indicator		2009	Final year base	trhhdrow
Receipts	Direct taxes	3.98	3.98	3.98
	Import tariffs	5.86	5.86	5.86
	Export taxes	Eps	Eps	Eps
	Other indirect taxes	2.25	2.25	2.25
	Private transfers	0.35	0.35	0.35
	Foreign transfers	2.63	2.63	2.61
	Factor income	0.04	0.02	0.02
	Domestic borrowing	2.32	2.32	2.30
	Foreign borrowing	2.47	3.67	3.63
	Total	19.90	21.09	21.01
Spending	Consumption	9.65	10.26	10.21
	Fixed investment	5.50	5.92	5.89
	Stock change	Eps	Eps	Eps
	Private transfers	3.63	3.63	3.63
	Foreign transfers	0.01	0.01	0.01
	Domestic interest payments	0.94	0.96	0.95
	Foreign interest payments	0.17	0.32	0.31
	Domestic capital transfers	Eps	Eps	Eps
	Total	19.90	21.09	21.01

2. Support measures simulations

In this session, we will show, step by step, how to define and runcounterfactual scenarios related to support measuresusing the Uganda 2009/10 dataset. Thus, the following assumes that the reader has successfully created an ISIM-MAMS application Excel file using the Uganda0910 dataset; certainly, the Excel file from the previous set of examples can be used – and just make sure it was saved.

Example 1: Increase in foreign transfers (aid) channeled to the financing of human development spending

In this example, we will define and run a scenario that simulates an increase in foreign aid during 2011/12 – 2015/16 that is channeled to the financing of human development spending (i.e., education, health and water and sanitation).

1. Create a new simulation using the **Scenario Manager** in the **Simulations** ribbon group. Then, click on **New simulation**. In the window that shows up,

    1. Introduce "aid-hd" (as before, the name of the newly-created simulation) in the **Name** field.

2. Introduce a short description in the **Description** field.
3. Keep the Multi-pass default for the **Mode** field. Once finished, click OK. The newly created simulation will be added to the Scenario Manager.

2. Go to the **siclossim** section in the **closure-and-rules** sheet to change the saving-investment closure. Then,

   1. In column sim, select aid-hd.
   2. In column 2009, select 1.

3. Go to the **govclossim** section of the **closure-and-rules** sheet to change the government closure (Figure 2.1). Then,

   1. In column sim, select aid-hd.
   2. In column 2009, select 9 (i.e., flexible government spending on one or more commodities).

Figure 2.1: Changing the Government Closure Rule

	A	B	C	D	E
7		govclossim(sim,t1)			government c
8		sim	2009	2010	2011
9	X	trhhdrow	5		
10	X	aid-hd	9		
11		Add row			
12					

4. Go to the **govspndrulesim** section of the **closure-and-rules** sheet (Figure 2.2). Then,

   1. In column sim, select aid-hd.
   2. In column ac, select c-edupgov.
   3. In column 2009, select 5 (i.e., flexible government consumption).
   4. Add rows to repeat steps 2-3 above for the following human development (HD) commodities: c-healthgov, and c-wtsn – the description of which is given in the **dictionary**.
   5. Click on **Add row**.
   6. On the new row, in column sim, select aid-hd.
   7. On the new row, in column ac, select c-edusgov (Secondary education, government).
   8. On the new row, in column 2009, select 4 (i.e., fixed educational quality).
   9. Add row to repeat 7-8 for the c-edutgov commodity (Tertiary education, government).
   10. Click on **Add row**.
   11. On the new row, in column sim, select aid-hd.
   12. On the new row, in column ac, select c-publicadm (Public administration).
   13. On the new row, in column 2009, select 1 (i.e., fixed growth rate).
   14. Add row to repeat 7-8 for the c-oinf commodity (Other infrastructure).

Figure 2.2: Selecting Rules for Government Spending Items – aid-hd

	sim	ac	2009	2010
64	**govspndrulesim(sim,ac,t1)**			rule for gove
65	sim	ac	2009	2010
66	X trhhdrow	c-edupgov	1	
67	X trhhdrow	c-edusgov	1	
68	X trhhdrow	c-edutgov	1	
69	X trhhdrow	c-healthgov	1	
70	X trhhdrow	c-wtsn	1	
71	X trhhdrow	c-oinf	1	
72	X trhhdrow	c-publicadm	1	
73	X			
74	X aid-hd	c-edupgov	5	
75	X aid-hd	c-edusgov	4	
76	X aid-hd	c-edutgov	4	
77	X aid-hd	c-healthgov	5	
78	X aid-hd	c-publicadm	1	
79	X aid-hd	c-oinf	1	
80	X aid-hd	c-wtsn	5	
81	Add row			
82				

5. Go to the **govrecrulesim** section of the **closure-and-rules** sheet. Then,

  1. In column sim, select aid-hd.
  2. In column ac, select trgovrow.
  3. In column 2009, select 2; this option allows to introduce a fixed GDP share for transfers to government from the rest of world – see **govrecgdpsim** below.
  4. Add rows and select option 1 in column 2009 for the ac elements gborz, gbormsz, and fborgov – se above for explanations.

6. Go to the **govrecgdpsim** section of the **closure-and-rules** sheet. Them

  5. In column sim, select aid-hd.
  6. In column ac, select trgovrow.
  7. In columns 2009-2015, introduce the values shown in Figure 2.3. This selection will set the GDP share of transfers to government from the rest of the world at 10% during 2011/12-2015/16, and will keep the reference scenarios values for 2009/10 and 2010/11 (do you know where values for 2009/10 and 2010/11 were taken from?).

Figure 2.3: Defining the GDP Share of Transfers from ROW to GOV

	A	B	C	D	E	F	G	H	I	J
19	govrecgdpsim(sim,ac,t1)			government receipt ac (GDP share)						
20	sim	ac	2009	2010	2011	2012	2013	2014	2015
21	X aid-hd	trgovrow	0.0263	0.0263	0.1000	0.1000	0.1000	0.1000	0.1000
22	Add row									
23										

7. Run the new simulation by clicking on **Run** in the **Simulations** ribbon group.
8. As before, the report sheets will be overwritten with the new set of results. For example, the dashboard will contain Figure 2.4, which shows an improvement in MDG 4.

Figure 2.4: Evolution of MDG 4
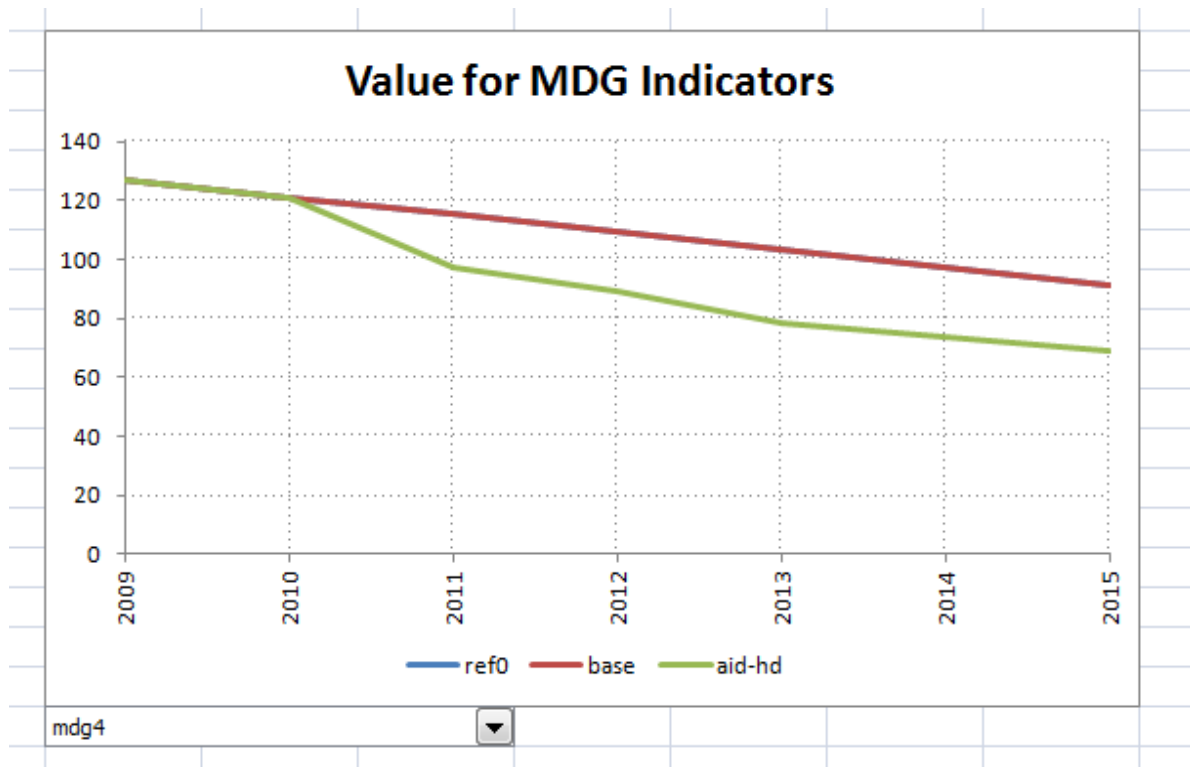
Example 2: Increase in foreign transfers channeled to the financing of "other" public infrastructure development

In this example, similar to the previous one, we will define and run a scenario that simulates an increase in foreign aid that is channeled to financing "other" public infrastructure spending (rather than human development as in the previous example).

1. Create a new simulation using the **Scenario Manager** in the **Simulations** ribbon group. Then, click on **New simulation**. In the window that shows up,

   1. Introduce "aid-infra" in the **Name** field.
   2. Introduce a short description in the **Description** field.
   3. Keep the Multi-pass default for the **Mode** field. Once finished, click OK. The newly created simulation will be added to the Scenario Manager.

The remaining steps are similar to those of the previous example, but in this case the government consumption of c-oinf (i.e., Other public infrastructure) should be left flexible. What options should you select in **govspndrulesim** for the other commodities consumed by the government?

Note that a comparison of results between the present scenario and the previous one is not straightforward; can you explain why? Hint: compare the evolution of GDP and foreign transfers in both scenarios.

3. Additional Exercises

Exercise 1

What assumption has been made for the evolution of tax receipts in the previous scenarios? Is this a reasonable assumption? Now, create additional simulations in order to run the world price scenarios using the following alternative closure and rules assumptions:

Closure

- **Government Closure (govclossim)** = direct tax rate is the clearing variable for the government budget.
- **Savings-Investment Closure (siclossim)** = household investment is the clearing variable (i.e., endogenous real growth, GDP and absorption shares).

Government Spending (govspndrulesim) - Rules

- Primary education = fixed quality at reference scenario values.
- Secondary education = fixed quality at reference scenario values.
- Tertiary education = fixed quality at reference scenario values.
- Health = fixed growth rate at reference scenario values (i.e., fixed government consumption at reference scenario values).
- Water and sanitation = fixed growth rate at reference scenario values (i.e., fixed government consumption at reference scenario values).
- Other infrastructure = fixed growth rate at reference scenario values (i.e., fixed government consumption at reference scenario values).

- Public administration = fixed growth rate at reference scenario values (i.e., fixed government consumption at reference scenario values).

Government Receipts (govrecrulesim) – Rules

- tax-dir = endogenous – see govclossim (!)
- tax-vat = fixed rates at reference scenario values
- tax-imp = fixed rates at reference scenario values
- trgovrow = fixed growth rate at reference scenario values
- trgovngov = fixed growth rate at reference scenario values
- gborz = fixed growth rate at reference scenario values
- gbormsz = fixed growth rate at reference scenario values
- fborgov = fixed growth rate at reference scenario values

Non-Government Payments (ngovpayrulesim) - Rules

- trngovrow = fixed growth rate at reference scenario values
- trfacrow = fixed growth rate at reference scenario values
- fborngov = fixed growth rate at reference scenario values
- fdiz = fixed growth rate at reference scenario values

In other to facilitate the solution of this exercise, we provide some example results.

Table 3.1: Simulation Results for trhhdrow; real macro indicators by simulation (% annual growth from first to final report year)

| | | Final year | | | |
| | | | pwefood- | pwmfood- | pwfood- |
Indicator	2009	base	ex	ex	ex
Absorption	39,003	5.78	6.64	5.60	6.47
Consumption - private	27,516	5.38	6.48	5.12	6.24
Consumption - government	3,340	7.53	7.17	7.60	7.24
Fixed investment - private	6,144	6.29	7.12	6.20	7.03
Fixed investment - government	1,902	7.60	7.43	7.60	7.43
Stock change	100	Eps	Eps	Eps	Eps
Exports	7,168	9.26	9.24	9.22	9.24
Imports	11,575	6.11	8.23	5.73	7.83
GDP at factor cost	31,791	6.50	6.76	6.43	6.71
Total factor employment (index)	Eps	4.59	4.85	4.55	4.82
Total factor productivity (index)	Eps	1.91	1.91	1.89	1.89
Real exchange rate (index)	Eps	0.14	-3.40	0.15	-3.38

Table 3.2: Simulation Results for trhhdrow; government receipts and spending in first report year and by simulation in final report year (% of nominal GDP)

Indicator		2009	Final year base	pwefood-ex	pwmfood-ex	pwfood-ex
Receipts	Direct taxes	3.98	3.98	3.99	3.98	3.99
	Import tariffs	5.86	5.86	4.95	5.89	4.97
	Export taxes	Eps	Eps	Eps	Eps	Eps
	Other indirect taxes	2.25	2.25	2.24	2.26	2.25
	Private transfers	0.35	0.35	0.35	0.35	0.35
	Foreign transfers	2.63	2.63	2.05	2.65	2.06
	Factor income	0.04	0.02	0.02	0.02	0.02
	Domestic borrowing	2.32	2.32	2.17	2.36	2.21
	Foreign borrowing	2.47	3.67	3.75	3.75	3.80
	Total	19.90	21.09	19.51	21.27	19.65
Spending	Consumption	9.65	10.26	9.41	10.40	9.52
	Fixed investment	5.50	5.92	5.28	5.94	5.29
	Stock change	Eps	Eps	Eps	Eps	Eps
	Private transfers	3.63	3.63	3.63	3.63	3.63
	Foreign transfers	0.01	0.01	0.01	0.01	0.01
	Domestic interest payments	0.94	0.96	0.90	0.98	0.91
	Foreign interest payments	0.17	0.32	0.29	0.32	0.29
	Domestic capital transfers	Eps	Eps	Eps	Eps	Eps
	Total	19.90	21.09	19.51	21.27	19.65

Exercise 2

In this exercise, you will create a new scenario in order to simulate the creation of fiscal space through an increase in direct tax collection. Then, the additional fiscal space will be to finance government spending in (a) human development, or (b) infrastructure. The following assumptions should be applied:

Exercise 2.a description

Government Closure = government spending is the clearing variable for the government budget.

Savings-Invesment Closure = same as exercise 1

Government Spending (govspndrulesim) - Rules

- Primary education = endogenous.
- Secondary education = fixed quality at reference scenario values.
- Tertiary education = fixed quality at reference scenario values.
- Health = endogenous.

- Water and sanitation = endogenous.
- Other infrastructure = fixed growth rate at reference scenario values (i.e., fixed government consumption at reference scenario values).
- Public administration = fixed growth rate at reference scenario values (i.e., fixed government consumption at reference scenario values).

Government Receipts (govrecrulesim) – Rules

- tax-dir = fixed rates at counterfactual values (see below) – (hint: use govspndgdpsim to impose to shock)
- tax-vat = fixed rates at reference scenario values
- tax-imp = fixed rates at reference scenario values
- trgovrow = fixed growth rate at reference scenario values
- trgovngov = fixed growth rate at reference scenario values
- gborz = fixed growth rate at reference scenario values
- gbormsz = fixed growth rate at reference scenario values
- fborgov = endogenous – see govclossim (!)

Non-Government Payments (ngovpayrulesim) - Rules

- trngovrow = fixed growth rate at reference scenario values
- trfacrow = fixed growth rate at reference scenario values
- fborngov = fixed growth rate at reference scenario values
- fdiz = fixed growth rate at reference scenario values

Shock

The direct tax rate during 2011-2015 is increased to 3 times the reference scenarios value – hint: see shock parameter taxratesim.

In other to facilitate the solution of this exercise, we provide some example results.

Table 3.3: Simulation Results for dirtax-hd and dirtax-infra; real macro indicators by simulation (% annual growth from first to final report year)

Indicator	2009	Final year base	dirtax-hd	dirtax-infra
Absorption	39,003	5.78	5.80	5.95
Consumption - private	27,516	5.38	4.17	4.06
Consumption - government	3,340	7.53	14.16	9.16
Fixed investment - private	6,144	6.29	5.13	4.75
Fixed investment - government	1,902	7.60	12.52	22.63
Stock change	100	Eps	Eps	Eps
Exports	7,168	9.26	8.81	9.92
Imports	11,575	6.11	5.88	6.55
GDP at factor cost	31,791	6.50	6.53	6.71
Total factor employment (index)	Eps	4.59	5.13	5.33
Total factor productivity (index)	Eps	1.91	1.41	1.38
Real exchange rate (index)	Eps	0.14	-0.02	0.12

Table 3.4: Simulation Results for dirtax-hd and dirtax-infra; government receipts and spending in first report year and by simulation in final report year (% of nominal GDP)

Indicator		2009	Final year base	dirtax-hd	dirtax-infra
Receipts	Direct taxes	3.98	3.98	11.98	11.92
	Import tariffs	5.86	5.86	5.75	5.94
	Export taxes	Eps	Eps	Eps	Eps
	Other indirect taxes	2.25	2.25	2.12	2.13
	Private transfers	0.35	0.35	0.32	0.32
	Foreign transfers	2.63	2.63	2.58	2.60
	Factor income	0.04	0.02	0.02	0.02
	Domestic borrowing	2.32	2.32	2.28	2.28
	Foreign borrowing	2.47	3.67	3.61	3.63
	Total	19.90	21.09	28.65	28.85
Spending	Consumption	9.65	10.26	16.17	11.00
	Fixed investment	5.50	5.92	7.59	12.96
	Stock change	Eps	Eps	Eps	Eps
	Private transfers	3.63	3.63	3.63	3.63
	Foreign transfers	0.01	0.01	0.01	0.01
	Domestic interest payments	0.94	0.96	0.94	0.94
	Foreign interest payments	0.17	0.32	0.31	0.31
	Domestic capital transfers	Eps	Eps	Eps	Eps
	Total	19.90	21.09	28.65	28.85

Exercise 2.b description

The definition of this exercise is similar to exercise 2.a; simply adjust the government spending rules as you see fit (see Table 3.3).