Macroeconometrics of the Global Economy (MaGE)
Version 2.1 (revision 60)

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Contents

1 Licensing

The reference document to be cited is:

Fouré, J., Bénassy-Quéré, A. and L. Fontagné (2012), 'The Great Shift: MaGE Projections for the World Economy at the 2050 Horizon', CEPII Working Paper 2012-03.

Please also note that you will need a valid license for Stata 11 or greater to run the model. In addition, you may have to verify that you are able to use the data we provide with the model.

2 Model description

MaGE is a macroeconometric model of the world economy made for projecting the global shifts of current century. It is based on a three-factor production function of labour, capital and energy, plus two forms of technological progress, we propose a long-run growth scenario for 147 countries and a time horizon of 2050 relying on the model MaGE (Macroeconometrics of the Global Economy). Our model is fitted with United Nations and International Labour Office labour projections, and econometric estimations of (i) capital accumulation, (ii) savings rate, (iii) relationship between savings and investment rate, (iv) education, (v) female participation, and (vi) technological progress (which includes energy and total f actor productivity). Our study provides five novelties. First, we account for energy constraints by including its consumption in the production function and by taking account of rents accruing to oil exporting countries. Second, we estimate a non-unitary relationship between savings and investment, departing from assumptions of either a closed economy or full capital mobility. Third, we model female participation rates consistently with education catch-up. Fourth, we account for the 2008-09 global crisis by initialising our projection model in 2013 while relying on IMF short-term forecasts between 2010 and 2012. Finally, we disentangle real gross domestic product (GDP) growth rates from relative price effects through a consistent Balassa-Samuelson effect.

3 Model's How To

3.1 Run the baseline scenario

Once the source code is extracted in a local folder, you only have to modify the file `0.master-file.do` located in the root folder. You have to set the `$BL_directory` variable to the value of the complete absolute path to the root directory of the model.

You can also check that the the scenario selected (its name is contained in the `$BL_scenario` variable) is the one you want to run (typically, it should be `reference_2050` or `reference_2100`).

3.2 Run custom scenarios

If you want to run custom scenarios, you are invited to create a scenario file (let's say `my_scenario.do`) and locate it in the `Scenarios` folder. Our advice is that you base your own scenario on one of our reference scenario, by first loading the reference scenario, and then modify the parameters you want. Details of parametrization are given in Section 4, especially in Table 3. Here is an example of how you could implement a simple scenario with different assumptions on population.

```
** load reference values for parameters
do "Scenarios\reference_2050.do"

** custom parameters
global un_scenario = "low"
```

Once your scenario is defined, you are able to launch it by modifying the `0.master-file.do` file in the following way. The scenario name has to be the same name as your previously created do-file.

```
** define scenario name
global BL_scenario = "my_scenario"

** run the scenario
do "Do\0.scenario.do"
```

4 Parametrization

There are some parameter that have to be set before running a scenario. These are displayed in Table 1.

Table 1: Run parameters

Parameter name	Description	Comment
`$BL_directory`	Model's location	Absolute path
`$BL_scenario`	Scenario name	The scenario `.do` is needed
`$force_db`	Force database creation	Use to force all steps for first scenario

The following parameters in Table 2 may **not be modified** without changing the source code of the model.

Finally, parameters listed in Table 3 are used to define scenario variants.

Table 2: Model ground parametrization (do not modify)

Parameter name	Description	Comment
`$BL_version`	model version	
`$energy`	Energy data source	To be deprecated
`$sigma`	KL-E elasticity of substitution	
`$rho`	Computed from sigma	
`$alpha`	KL share	
`$deprec`	Depreciation rate	
`$fe_adapt`	Toggle Fixed-effect modification	0 or 1
`$fe_remove`	Toggle non-significant fixed effects removal	0 or 1
`$educ_mode`	Way of measuring education	To be deprecated
`$moy_start`	Starting of reference period	
`$moy_end`	End of reference period	
`$sav_mode`	Savings rate computation mode	To be deprecated `"fe"` for fixed effect / `"moy"` for ref period
`$tfp_mode`	TFP computation mode	To be deprecated `"fe"` for fixed effect / `"moy"` for ref period
`$tfp_lead`	Way of computing TFP leaders	`max`, `mean4` or `mean5`

5 Results

Results of MaGE are produced in excel `.xls` format or Stata `.dta` format. Several options are available to look at the results.

5.1 Full results

Full results are available in `.dta` format, and are located in the `%MODEL_FOLDER%\Results\DTA` folder. The file corresponding to scenario `scen` is called `mage-2.1-scen-FULL.dta`. Variables of interest are displayed in Table 4.

The first parameters are identifying observations. Several country encodings are available.

The following parameters are the output of econometric estimations. These are the parameter used for projection. Finally, the variables of interest are displayed. Table 5 presents main variables of interest.

Table 3: Scenario parametrization

Parameter name	Description	Comment
`$sigma_2012`	KL-E elasticity for projections	
`$cobbdouglas`	Toggle for CES/Cobb-Douglass	
`$end_year`	Target projection year	From 2013 to 2100
`$e_price`	Energy price scenario	`"high"`, `"med"` or `"low"`
`$institutions`	Ref period convergence	`"cv2100"` or nothing
`$un_scenario`	UN population variants	`"med"`, `"high"` or `"low"`
`$migration_eu`	Additional migration in thousands	
`$migration_ssa`	Additional migration in thousands	
`$migration_med`	Additional migration in thousands	
`$activity_rate_mode`	DEPRECATED	
`$female_participation`	Toggle for female participation	0 or 1
`$closed_economy`	S-I relation modification	0 for FH / 1 for I=S / 2 for all OCDE value / 3 Deprecated / 4 for convergence towards I=S
`$tfp_slowing`	TFP exogenous slowing	≤ 1 for slowing / ≥ 1 for acceleration
`$educ_cv`	Convergence modification for education	Half-life time modification in percent (e.g. = 0.5 for half Half-Life time, and then faster growth)
`$energ_exo`	Exogenous E productivity modifier	In percentage. Only influences the consequence of B on Y, and not B itself

Table 4: Identifying observations

Variable name	Description
`code_wb`	World Bank country code
`name`	World Bank country name
`code_bit`	International Labor Organization country code
`code_un`	United Nations country code
`zone`	INGENUE zone classification
`year`	Year of the observation
`code_mirage`	GTAP country code
`code_gtap`	GTAP zone classification
`ocde_dummy`	0-1 dummy for OECD membership
`income_class`	United Nations income classification (**L**ow, **M**edium or **H**igh)
`ue_dummy`	0-1 dummy for European Union membership
`code_z`	Custom regional classification
`US_dummy`	0-1 dummy for the USA
`CCCP_dummy`	0-1 dummy for former USSR membership

Table 5: Selected variables from full results

Variable name	Description	Unit
`age1-age15`	Population by age group	number of people
`f_actpop`	Female active population	thousands of people
`p_oil`	Oil price	constant 2005 USD
`H_pred`	Tertiary education	Share of working age population
`Hs_pred`	Secondary education	Share of working age population
`Acorr_pred`	Oil-corrected TFP	
`Bcorr_pred`	Oil-corrected Energy productivity	constant 2005 USD per barrel
`A_pred`	Non-corrected TFP	
`B_pred`	Non-corrected energy productivity	constant 2005 USD per barrel
`K_pred`	Capital stocks	constant 2005 USD
`Ycorr_pred`	Non-oil GDP	constant 2005 USD
`Y_pred`	Total GDP	constant 2005 USD
`E_pred`	Energy consumption	barrels
`Srate_pred`	Savings rate	% of GDP
`Irate_pred`	Investment rate (GFCF)	% of GDP
`Y_USD_cst05_p05`	Total GDP	constant 2005 USD
`Y_PPA_cst05_p05`	Total GDP	constant 2005 PPP
`Y_USD_crt`	Total GDP	Including real appreciation
`Ycap_PPA_05`	GDP per capita	2005 PPP
`RER_pred`	Real exchange rate	

5.2 Selected Results

Selected variables are displayed in other files. These are located in the `%MODEL_FOLDER%\Results\DTA` folder. The files are called `mirage-2.1-scen.dta`. These variables are the one to be used in MIRAGE.

Table 6: Variables from selected results

Variable name	Description	Unit
`Oil_price`	World average oil price	2005 constant USD
`TotPop`	Total population	Number of people
`ActPop`	Active population	Number of people
`H_pred`	Tertiary education	Share of working-age population
`Hs_pred`	Secondary education	Share of working-age population
`GDP`	Gross Domestic Product	Constant 2005 USD
`SAV`	Savings rate	Percentage of GDP
`INV`	Investment rate (fixed capital formation)	Percentage of GDP
`GDP_growth`	GDP growth	Annual percentage change
`Energy_ef`	Energy productivity	Constant 2005 USD per barrel
`TFP`	Total Factor Productivity	
`CC`	Current Account balance	Constant 2005 USD
`SkilledPop`	Skilled active population (tertiary)	Number of people
`Unskilled_ActPop`	Unskilled active population (less than tertiary)	Number of people

5.3 Output for MIRAGE

The selected variables are also directly available to use with MIRAGE. There are a few more steps in order to use the gms file creator. You have to call the file `%MODEL_FOLDER%\Do\3.projections\5.export_all.do` at the end of your `0.master-file.do`, after having set at least a base scenario `$base_scen` and optionally other scenarios `$additional_scen` separated by empty space (if no additional scenarios, only set the variable to `""`). Exemple:

```
global base_scen = "reference_2100"
global additional_scen = "scenario1 scenario2"

do "Do\3.projections\5.export_all.do"
```

This will generate `.gms` files in the `%MODEL_FOLDER%\Results\XLS\MIRAGE` folder. These files can then directly overwrite their antecedents in MIRAGE folder.