MAMS MACRO DATA REQUIREMENTS

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Presentation for the Workshop of the UNDP – UNDESA – World Bank – LAS Project “Assessing Development Strategies to Achieve the MDGs in the Arab Region”, Cairo, April 2-5, 2007

INTRODUCTION

- By default, all data for MAMS can be introduced in the EXCEL file. MAMS can be run in two alternative ways:
  - i) full model with MDG targeting; and
  - ii) macro model (useful for macro debugging).
- Steps MACRO version:
  - 1) make a copy a test-macro.xls and test-macro.dat;
  - 2) rename to <country>-macro.xls and <country>-macro.dat, respectively; and
  - 3) start by making changes to both files.

WHY A MACRO VERSION?

- Naturally, a MACRO version of MAMS requires less data (i.e., small SAM and only non-MDG data) and faster than the full MDG version of MAMS.
- Can be used to produce a reasonable baseline in terms of macroeconomic variables.
- It allows the user to catch errors as early as possible. Do not wait until you have a full MAMS database to solve all data problems!

SAM ACCOUNTS IN TEST-MACRO.XLS

Activities/Commodities (2)

- Private
- Government

Factors of Production (2)

- Labor
- Government Capital

Institutions (3)

- Household
- Government
- Rest of World

Savings Accounts (3)

- Household
- Government
- Rest of World

Capital Accounts (3)

- Household
- Government
- Rest of World

Tax Accounts (3)

- Direct taxes
- Import taxes
- Other indirect taxes

Investment Accounts (2)

- Private
- Government

Other Accounts (2)

- Domestic Interest Payments
- Foreign Interest Payments

MINIMUM DATA NEEDS FOR MACRO VERSION

- SAM
- ewidedata
- tradelas
- miscdata
- depr0
- qfbase
- qfacgrwrat
- govinv, govconrat
- uerat00, ueratmin, wfminelas
- pop0
- tfpelastrd0, tfp010, mtfp, mcapgov
- debt00

INTRODUCTION

- The MAMS can be solved in two different versiones:
  - Full model with

EXCEL SHEET EWIDEDATA

- ewidegrw
- tfpexoggrw
- pwegrw
- pwmgrw
- savelas
- prodelas
- prodelas2
- elasac
- elashd
- leselas1
- frisch

EXCEL SHEET MISCDATA

- shrgborbond
- pagrw-areg
- dkgrw-areg
- disc_rat
- grwexpeclag
- fdigrw
- exr00dol
- tarfdebtadj
- targbondadj
- netprfrat

EXCEL SHEET QFBASE

- This parameter refers to base-year labor force by labor type and activity ('000).

EXCEL SHEETS PWEGRW AND PWMGRW

- The parameter pwegrw(c) refers to annual growth rate for world price of exports.
- The parameter pwmgrw(c) refers to annual growth rate for world price of imports.

pwegrw(c)

c-agr	c-mnf	c-oil
0.03	-0.01	0.05

pwmgrw(c)

c-agr	c-mnf	c-oil
0.03	-0.01	0.05

ESTIMATING BASE-YEAR GOVERNMENT CAPITAL STOCKS

- Usually, no returns to public capital appear in the SAM. However, capital is needed for public provision of MDG commodities (education, health, water and sanitation). MAMS allows two alternative estimation methods:
  - PIM (Perpetual Inventory Method) – stock defined on the basis of time series of old investments and depreciation rates.
  - Relationship between expansion of government consumption (service provision) and past investments.
- See the EXCEL sheets depr0(f, t1), govinvpim(f,t11), govinv(f,t11), and govconrat(c).

EXCEL SHEETS DEPR0, GOVINV, AND GOVCONRAT

- GOVINV. 5 years of historical government investment data at base-year prices in same unit as SAM. Although the data entered is linked to capital factors, it in fact refers to investment.
- GOVCONRAT. Ratio between real gov consumption in base year and first year of gov inv series.
- DEPR0. Depreciation rate for factor f in t1.

govinv(f,t11)

	1997	1998	1999	2000	2001
f-capedup1	0.079	0.084	0.089	0.095	0.100
f-capedus	0.115	0.122	0.129	0.137	0.145
f-capedut	0.159	0.169	0.179	0.189	0.201
f-caphlt1g	0.070	0.074	0.078	0.083	0.088
f-capoinf	1.663	1.762	1.868	1.980	2.099
f-capogov	2.148	2.277	2.413	2.558	2.712

depr0(f,t1)

f-capedup1	0.020
f-capedus	0.020
f-capedut	0.020
f-caphlt1g	0.020
f-capoinf	0.020
f-capogov	0.020

govconrat(c)

c-edup1	c-edus	c-edut	c-hlt1g	c-oinf	c-ogov
1.338	1.338	1.338	1.338	1.338	1.338

ESTIMATING BASE-YEAR GOVERNMENT CAPITAL STOCKS

a 3 year example

Defining capital stock in current and previous years on the basis of data on investment, depreciation rates, and earlier capital stocks.

$$K_t = I_{t-1} + (1 - \delta)K_{t-1}$$

$$K_{t-1} = I_{t-2} + (1 - \delta)K_{t-2}$$

$$K_{t-2} = I_{t-3} + (1 - \delta)K_{t-3}$$

Substituting,

$$K_t = I_{t-1} + (1 - \delta)[I_{t-2} + (1 - \delta)K_{t-2}]$$

$$K_t = I_{t-1} + (1-\delta)I_{t-2} + (1-\delta)^2[I_{t-3} + (1-\delta)K_{t-3}]$$

$$K_t = I_{t-1} + (1-\delta)I_{t-2} + (1-\delta)^2 I_{t-3} + (1-\delta)^3 K_{t-3} \qquad (1)$$

ESTIMATING BASE-YEAR GOVERNMENT CAPITAL STOCKS

a 3 year example

Defining capital stock in current and previous years on the assumption that the capital stock grows at the same rate as consumption,

$$K_t = (1+g)K_{t-1}$$

$$K_{t-1} = (1+g)K_{t-2}$$

$$K_{t-2} = (1+g)K_{t-3}$$

Substituting,

$$K_t = (1+g)(1+g)(1+g)K_{t-3}$$

$$K_t = (1+g)^3 K_{t-3} \qquad (2)$$

ESTIMATING BASE-YEAR GOVERNMENT CAPITAL STOCKS

a 3 year example

Substituting (2) into (1),

$$(1+g)^3 K_{t-3} = I_{t-1} + (1-\delta) I_{t-2} + (1-\delta)^2 I_{t-3} + (1-\delta)^3 K_{t-3}$$

$$\left[(1+g)^3 + (1-\delta)^3\right] K_{t-3} = I_{t-1} + (1-\delta) I_{t-2} + (1-\delta)^2 I_{t-3}$$

$$K_{t-3} = \frac{I_{t-1} + (1-\delta) I_{t-2} + (1-\delta)^2 I_{t-3}}{\left[(1+g)^3 + (1-\delta)^3\right]}$$

where the term (1+delta)^3 refers to the share of capital stock of first year of historic investment series that remains.

EXCEL SHEET MCAPGOV

- This parameter refers to the marginal product of government capital. This parameter provides an exogenous value for the total change in GDP per unit of extra government capital "f" in the base year.
- By assumption, is does not affect the evolution of GDP on the baseline. However, it does affect the evolution of sectoral levels of production.
- I WILL COMPLETE. MAKE A FULL EXPLANATION!!!

EXCEL SHEET WFMINELAS

- This parameter refers to the elasticity of minimum wage for (labor) factor f with respect to determinant ac
- The equation for the minimum wage (WFMINDEF) applies only to those factors that are in the set fuendog.

uerat00(ac)

f-labn	f-labs	f-labt
0.100	0.050	0.050

ueratmin(f,t1)

	2002
f-labn	0.05
f-labs	0.05
f-labt	0.05

wfminelas(f,ac)

	qhpc	pva	erat	cpi
f-labn		0.1	3.0	0.5
f-labs		0.1	3.0	0.5
f-labt		0.1	3.0	0.5

UNEMPLOYMENT EQUATIONS

$$WFMIN_{ft} = WF_f^0 \left(\frac{QHPC_t}{QHPC^0} \right)^{\varphi wfqhpc_f} \left(\frac{1-UERAT_{ft}}{1-UERAT_f^0} \right)^{\varphi wferat_f}$$

$$\left(\frac{CPI_t}{CPI^0} \right)^{\varphi wfcpi_f} \left(\frac{PVAAVG_t}{PVAAVG^0} \right)^{\varphi wfpva_f}$$

$$WF_{ft} \geq WFMIN_{ft}$$

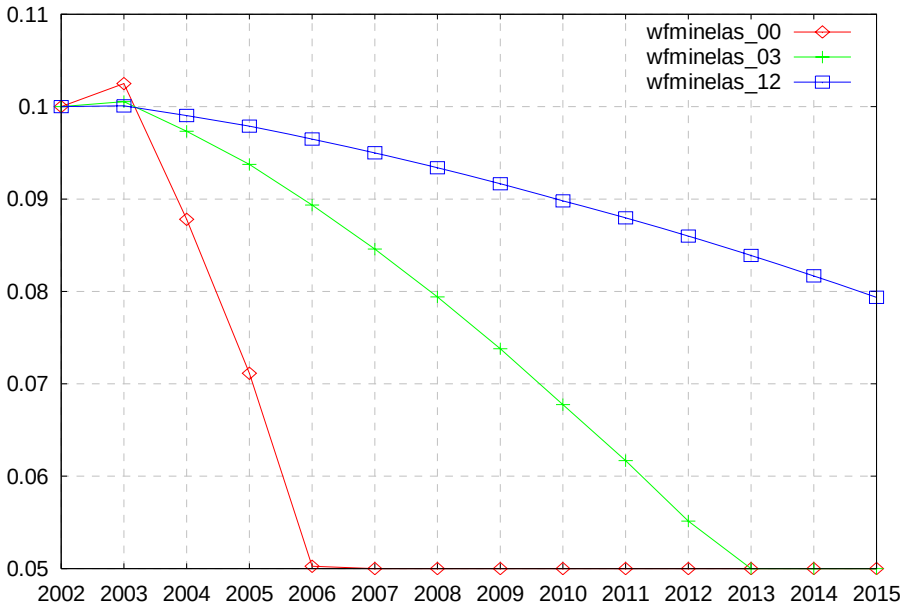
$$UERAT_{ft} \geq ueratmin_{ft}$$

$$\left(WF_{ft} - WFMIN_{ft}\right)\left(UERAT_{ft} - ueratmin_{ft}\right) = 0$$

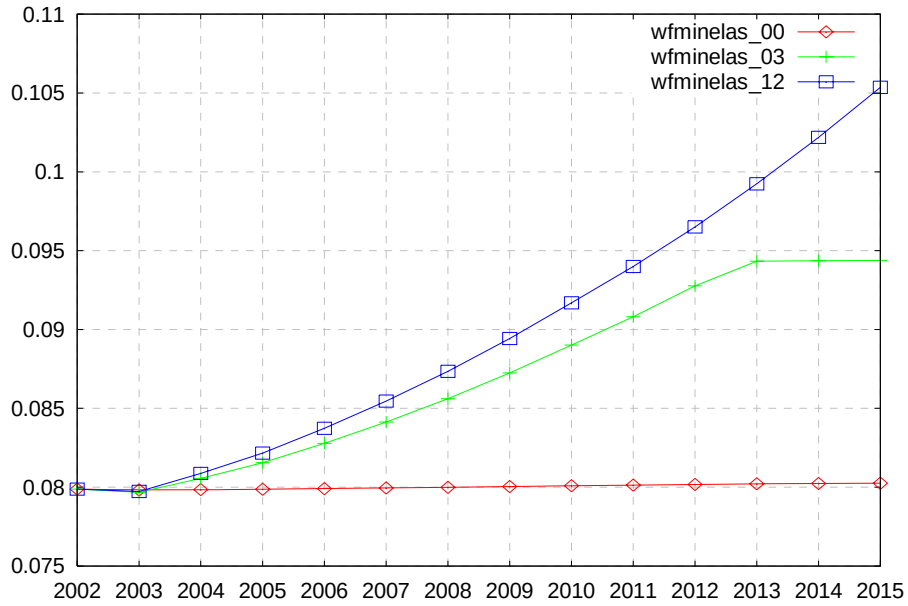
$$QFS_{ft} = \left(1-UERAT_{ft}\right) \sum_{ins} QFACINS_{ins,f,t}$$

WFMINELAS(‘f-labn’,’erat’)
SENSITIVITY OF RESULTS

UERATX('f-labn‘,t) - BASE



WFMINX('f-labn‘,t) - BASE



THE MDG MODULE - STANDARD MDG

MAMS uses logistic functions to relate service delivery and other determinants to MDG indicators. The logistic function shows IRTS at low levels of HD indicators and DRTS at high levels of HD indicators.

$$M = ext + \frac{\alpha}{1 + e^{(\gamma + \beta Z)}}$$

Where

- M is the indicator used to monitor the MDG,
- Z in an intermediate variable that summarizes the determinants of MDG performance,
- ext is the extreme level of M, and
- alpha, beta, and gamma are parameters.

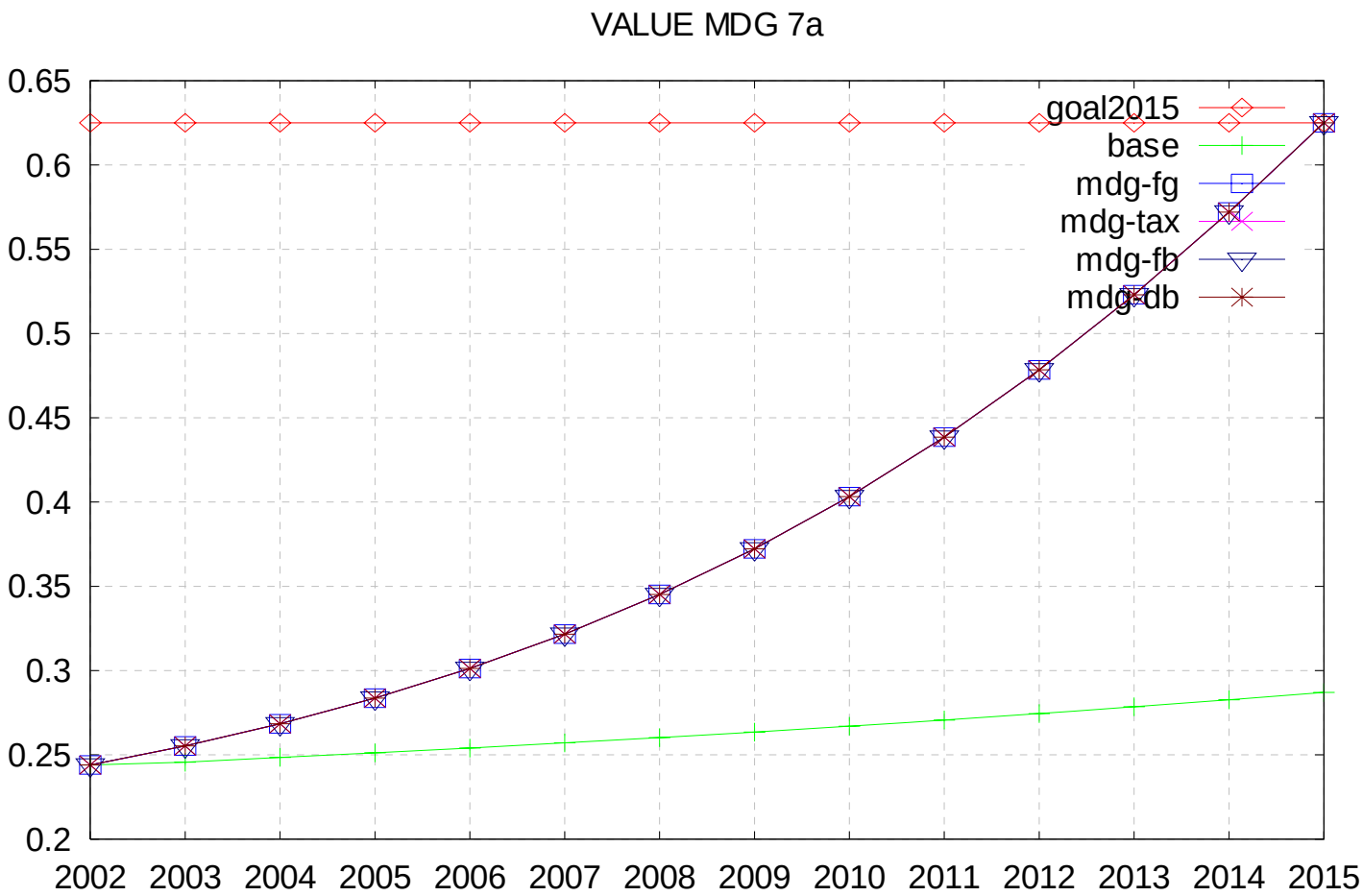
PARAMETERS LOGICTIC FUNCTIONS

- alpha is used the replicate the initial MDG value and the slope of the function;
- beta shows the sensitivity of the indicator to changes in Z; and
- gamma determines whether IRTS or DRTS prevail at the starting point.

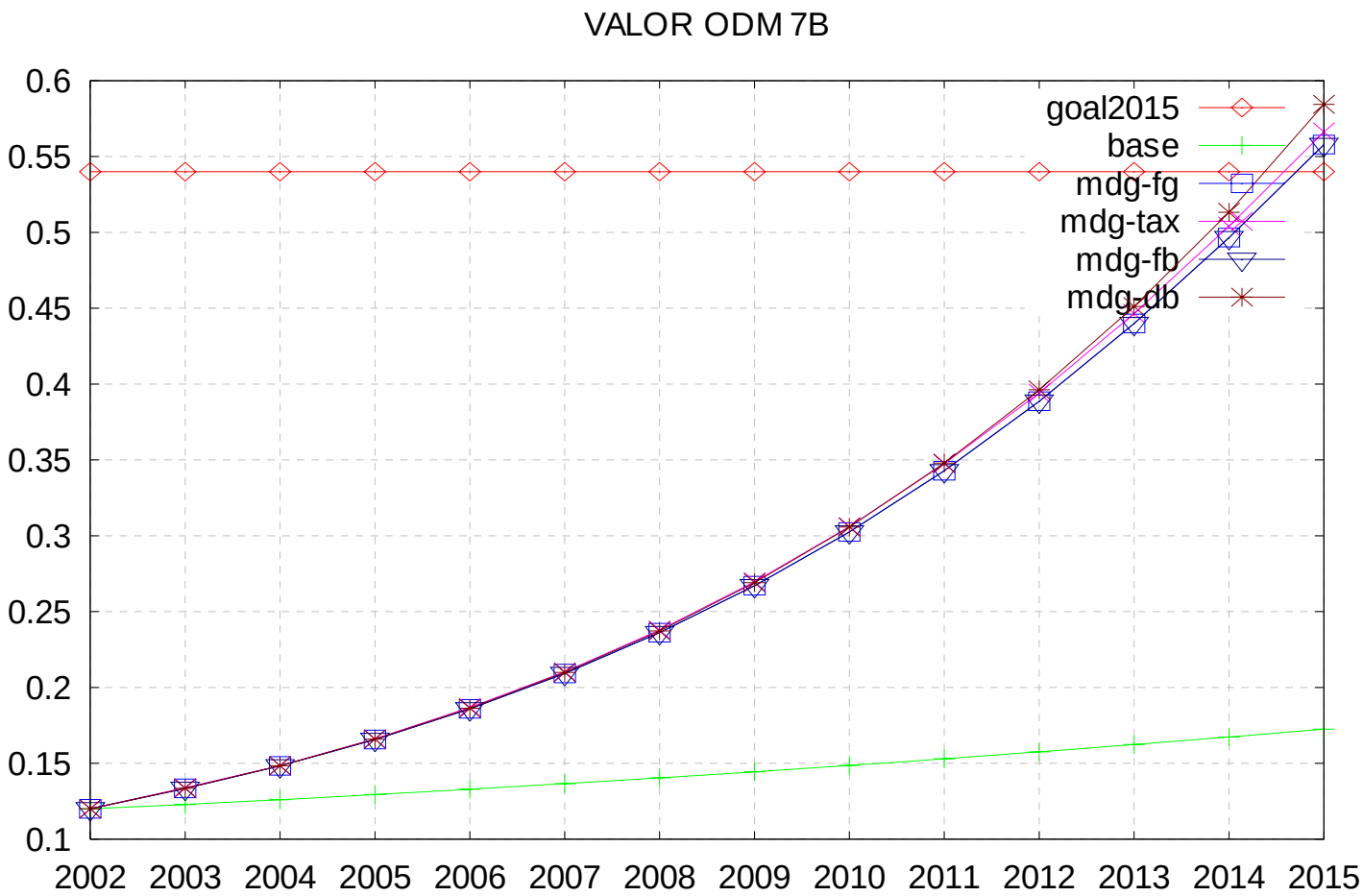
The intermediate variable Z is defined by a Constant Elasticity (CE) function:

$$Z = \alpha ce.D_1^{\phi_1}.D_2^{\phi_2}.D_n^{\phi_n}$$

EXAMPLE USE LOGISTIC FUNCTION



EXAMPLE USE LOGISTIC FUNCTION



MDG MODULE DATA REQUIREMENTS

- Base year values and 2015 targets for MDG indicators (see mdgeduscen).
- Extreme values for MDG indicators (see ext_mdg0).
- Elasticities of MDG indicators w.r.t. the relevant determinants (see mdgeduelas).
- The position of the initial situation (in terms of MDG or Z) relative to the inflection point (see dmo2.gms).
- A scenario indicating one set of 2015 values for the arguments of Z (i.e., D1, D2, Dn) under which the MDG in question is achieved (see mdgeduscen).

EXCEL SHEET MDGKEYINDIC AND EXT_MDG0

The information in this sheet is used to calibrate the logistic functions used in the MDGs production functions and to model student's behavior. The column goal2015 is linked to the sheet mdgeduscen.

	1990	baseyr	goal2015
mdg1	0.384	0.362	0.192
mdg2	0.240	0.360	0.980
mdg4	0.204	0.163	0.068
mdg5	0.870	0.609	0.218
mdg7a	0.250	0.244	0.625
mdg7b	0.080	0.120	0.540

mdg4	mdg5	mdg7a	mdg7b
0.005	0.01	1	1

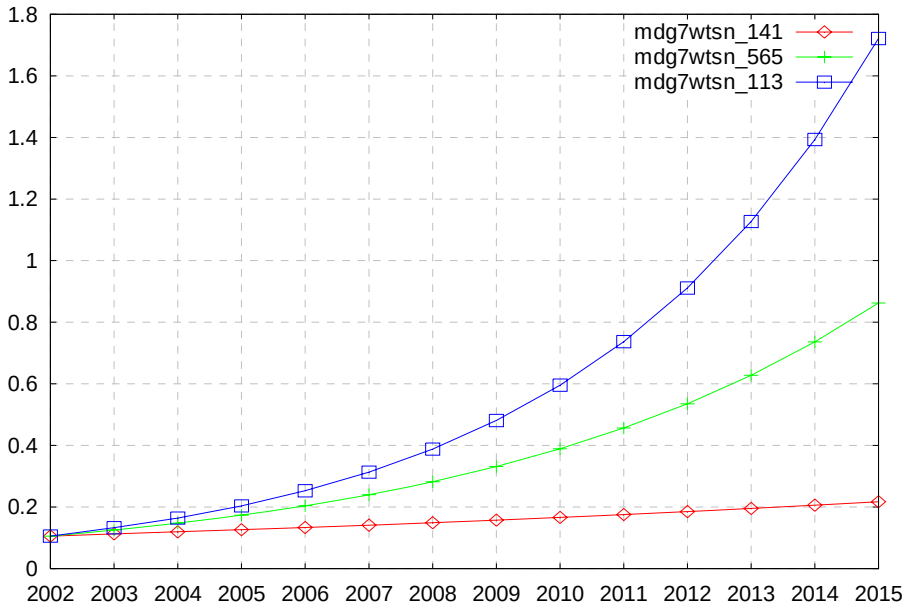
EXCEL SHEET MDGEDUSCEN

- This parameter contains values for determinants (under goal-achieving scenario) and goals by MDG or education indicator.
- This parameter is used to compute trajectories for the determinants of the MDGs (educational behaviors for MDG 2) that assure that the goal is achieved.

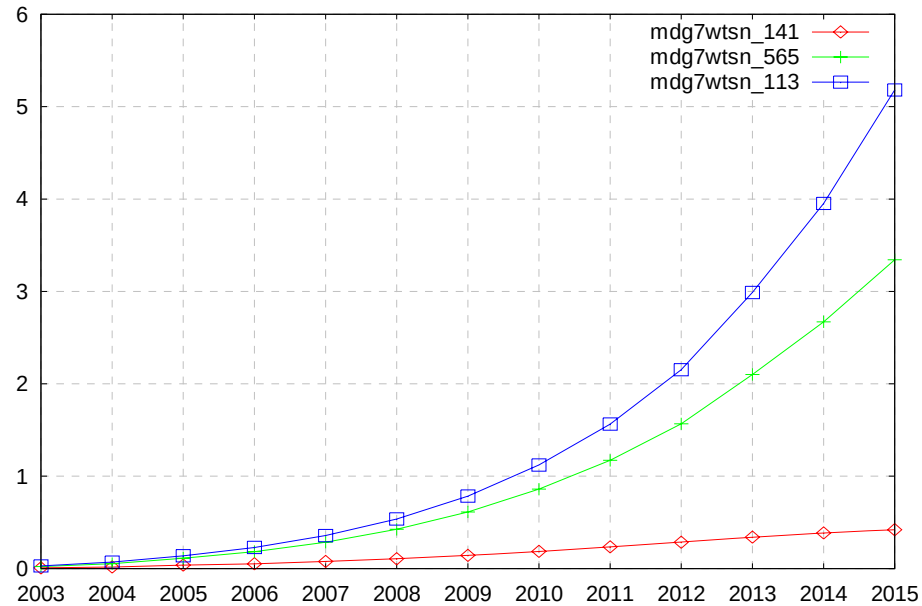
		c-hlt	c-wtsn	edu-qual	f-capoinf	hhdconspc	mdg4	mdg7a	mdg7b	wage-prem	goal
mdg4	dummy	1.257			1.886	2.133		2.561	4.500		0.068
mdg5	dummy	1.257			1.886	2.133		2.561	4.500		0.218
mdg7a	dummy		5.653		1.886	2.133					0.625
mdg7b	dummy		5.653		1.886	2.133					0.540
g1entry	c-edup1			1.750	1.629	1.791	0.552			1.000	0.996
pass	c-edup1			1.750	1.629	1.791	0.552			1.000	0.996
pass	c-edup2			1.700	1.886	2.133	0.333			1.000	0.900
pass	c-edus			1.700	1.886	2.133	0.333			1.000	0.867
pass	c-edut			1.700	1.886	2.133	0.333			1.000	0.888
grdcont	c-edup2			1.700	1.886	2.133	0.333			1.000	0.996
grdcont	c-edus			1.700	1.886	2.133	0.333			1.000	0.850
grdcont	c-edut			1.700	1.886	2.133	0.333			1.000	0.363

MDGEDUSCEN('mdg7a','dummy','c-wtsn')
SENSITIVITY OF RESULTS

QGX('c-wtsn') - MDG7-FG



FGRANTX - MDG7-FG



EXCEL SHEET MDGEDUELAS

- This parameter contains the information for the elasticity of the MDG or education indicator with respect its determinants.
- There must be an elasticity in the matrix below for every value in mdgeduscen with the exception of "goal". Below we explain the interpretation of these elasticities.

		c-hlt	c-wtsn	edu-qual	f-capoinf	hhdconspc	mdg4	mdg7a	mdg7b	wage-prem
mdg1	dummy					-1.0				
mdg4	dummy	1.0			0.1	0.1		0.2	0.2	
mdg5	dummy	1.0			0.1	0.1		0.1	0.1	
mdg7a	dummy		1.0		0.1	0.2				
mdg7b	dummy		1.0		0.2	0.1				
g1entry	c-edup1			1.0	0.1	0.1	-0.1			0.1
pass	c-edup1			1.0	0.1	0.1	-0.1			0.1
pass	c-edup2			1.0	0.1	0.1	-0.1			0.1
pass	c-edus			1.0	0.1	0.1	-0.1			0.1
pass	c-edut			1.0	0.1	0.1	-0.1			0.1
grdcont	c-edup2			1.0	0.1	0.1	-0.1			0.1
grdcont	c-edus			1.0	0.1	0.1	-0.1			0.1
grdcont	c-edut			1.0	0.1	0.1	-0.1			0.1

STUDENT BEHAVIOR – LOGISTIC FUNCTION

For MDG 2 MAMS uses logistic functions to model the educational behaviors of students.

$$SHRED_{b,c,t} = extedu_{b,c} + \frac{\alpha edu_{b,c}}{1 + e^{\gamma edu_{b,c} + \beta_{b,c} ZEDU_{b,c,t}}}$$

The variable for student share with behavior b in cycle c is a logistic function of intermediate behavior variable ZEDU(b,c,t).

- parameters: extreme value, alpha, beta, and gamma;
- extreme value: maximum attainable set at 0.999; and
- alpha, beta, and gamma are calibrated in the model.

STUDENT BEHAVIOR - CE FUNCTION DEFINING INTERMEDIATE VARIABLE

$$ZEDU_{b,c,t} = \alpha educe.EDUQUAL_{c,t}^{\phi edu_{b,c,'edu-qual'}}$$

$$\prod_{flab,\,flab'} \left(\frac{WF_{flab,t}}{WF_{flab',t}} \Big/ \frac{WF^{0}_{flab}}{WF^{0}_{flab'}} \right)^{\phi edu_{b,c,'wage-prem'}} \prod_{mdg'} \left(\frac{MDGVAL_{mdg',t}}{MDGVAL^{0}_{mdg'}} \right)^{\phi edu_{b,c,mdg'}}$$

$$\prod_{fcapgovinf} \left(\frac{\sum_{ins} QFACINS_{ins,\,fcapgovinf,t}}{\sum_{ins} QFACINS^{0}_{ins,\,fcapgovinf}} \right)^{\phi edu_{b,c,\,fcapgovinf}} \left(\frac{QHPC_{t}}{QHPC^{0}} \right)^{\phi edu_{b,c,'hhdconspc'}}$$

The intermediate variable for student share with behavior b in cycle c is a CE function of: education quality; wage premium; student health (i.e., MDG 4); level of infrastructure; and per capita household consumption.

CALCULATING MDG 2 VALUE

- The MDG2 is defined as the product of the rates of entry and passing during the years of study for the cohort that is scheduled to graduate from (1st) cycle primary in t.
- MDG 2 =
  g1entry1999 * pass1999 * pass2000 * pass2001 * pass2002
- MDG 2 =
  0.740 * 0.777 * 0.777 * 0.777 * 0.777 = 0.269

		1999	2000	2001	2002
g1entry	c-edup1	0.740	0.740	0.740	0.740
pass	c-edup1	0.777	0.777	0.777	0.777

CALCULATING MDG 2 VALUE

c	behav		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
c-edup1	g1entry	1999	Y													
c-edup1	g1entry	2000		Y												
c-edup1	g1entry	2001			Y											
c-edup1	g1entry	2002				Y										
c-edup1	g1entry	2003					Y									
c-edup1	g1entry	2004						Y								
c-edup1	g1entry	2005							Y							
c-edup1	g1entry	2006								Y						
c-edup1	g1entry	2007									Y					
c-edup1	g1entry	2008										Y				
c-edup1	g1entry	2009											Y			
c-edup1	g1entry	2010												Y		
c-edup1	g1entry	2011													Y	
c-edup1	g1entry	2012														Y
c-edup1	pass	1999	Y													
c-edup1	pass	2000	Y	Y												
c-edup1	pass	2001	Y	Y	Y											
c-edup1	pass	2002	Y	Y	Y	Y										
c-edup1	pass	2003		Y	Y	Y	Y									
c-edup1	pass	2004			Y	Y	Y	Y								
c-edup1	pass	2005				Y	Y	Y	Y							
c-edup1	pass	2006					Y	Y	Y	Y						
c-edup1	pass	2007						Y	Y	Y	Y					
c-edup1	pass	2008							Y	Y	Y	Y				
c-edup1	pass	2009								Y	Y	Y	Y			
c-edup1	pass	2010									Y	Y	Y	Y		
c-edup1	pass	2011										Y	Y	Y	Y	
c-edup1	pass	2012											Y	Y	Y	Y
c-edup1	pass	2013												Y	Y	Y
c-edup1	pass	2014													Y	Y
c-edup1	pass	2015														Y

EXCEL SHEET SHREDBAR0(behav,c,t11)

- The set t11 includes the base year (e.g., 2002) and the preceding years that correspond to the length of the first school cycle (e.g., the cycle is 4 years and thus use years 1999-2002). Notice how MDG 2 is calculated.
- The values in this parameter correspond to total education because private and public are summed together in the model.
- Relationships that MUST hold:
  - (1) rep + dropout + pass = 1 (for each cycle and for each grade within each cycle);
  - (2) pass = grdcyc + contcyc; and
  - (3) grdcont + grdexit = 1 (for each cycle).

EXCEL SHEET SHREDBAR0(behav,c,t11)

		1999	2000	2001	2002
g1entry	c-edup1	0.740	0.740	0.740	0.740
pass	c-edup1	0.777	0.777	0.777	0.777
pass	c-edup2	0.718	0.718	0.718	0.799
pass	c-edus	0.701	0.701	0.701	0.734
pass	c-edut	0.776	0.776	0.776	0.776
grdcont	c-edup2				0.700
grdcont	c-edus				0.700
grdcont	c-edut				0.150
grdexit	c-edup2				0.300
grdexit	c-edus				0.300
grdexit	c-edut				0.850
rep	c-edup1				0.160
rep	c-edup2				0.173
rep	c-edus				0.151
rep	c-edut				0.112
dropout	c-edup1				0.063
dropout	c-edup2				0.027
dropout	c-edus				0.115
dropout	c-edut				0.112

EXCEL SHEET QENRBAR(C,T11)

- This parameter refers to the number of enrolled students in cycle c by year.
- A history of the number of students enrolled in each education cycle. The number of year-columns to include is determined by the length of the primary school cycle.

	1999	2000	2001	2002
c-edup1	5169.344	5348.593	5534.058	5725.954
c-edup2	2037.426	2108.074	2181.173	2256.806
c-edus	618.078	639.51	661.686	684.63
c-edut	51.725	53.519	55.374	57.295

TOTAL FACTOR PRODUCTIVITY

REFERENCES

- Bourguignon, Francois; Diaz-Bonilla, Carolina and Lofgren, Hans (2006). Aid, Service Delivery and the MDGs in an Economy-Wide Framework. World Bank.
- Lofgren, Hans and Diaz-Bonilla, Carolina (2007). MAMS: An Economywide Model for Analysis of MDG Country Strategies - Technical Documentation. World Bank.