A Single Country CGE Model (smod_t): Part 2

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Outline

- *Introduction*
- *Agents in the Model*
- *Prices*
- *Taxes*
  - *Tax instruments*
  - *Tax adjustors*
- *Production (review)*
  - *Factor Demands, Intermediate input demands, factor payments*
- *Income (review)*
- *Expenditure (review)*
- Macroeconomic Closure and Market Clearing
  - Macroeconomic closure options
  - Market clearing options

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Macroeconomic closure options

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Macroeconomic Closure: Equations

$$KAPGOV = YG - EG$$ **Internal balance**

$$KAPWOR = \left(\sum_c PWM_c * QM_c\right) - \left(\sum_c PWE_c * QE_c\right)$$ **External balance**

$$TOTSAV = INVEST + WALRAS$$ **I_S balance**

What are the macroeconomic mechanisms that determine how these equilibrating conditions operate?

Different world views embedded in different macroeconomic 'schools' of thought

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Closure: Foreign Exchange

```
* ## FOREIGN EXCHANGE MARKET CLOSURE
* external balance fixed; ER the equilibrating variable

* ER.FX           = ER0 ;

* ER fixed; external balance the equilibrating variable

 KAPWOR.FX        = KAPWOR0 ;

* Fixed world prices small country assumption
 PWM.FX(c)        = PWM0(c) ;
 PWE.FX(c)        = PWE0(c) ;
```

$$KAPWOR = \left(\sum_c PWM_c * QM_c\right) - \left(\sum_c PWE_c * QE_c\right)$$ **External balance**

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Closure: Investment-Savings

```
* ## INVESTMENT-SAVINGS CLOSURE
* Savings rate fixed; INVEST the equilibrating variable
* i.e., the model is savings driven, then fix SADJ

 SADJ.FX          = SADJ0 ;

* Investment fixed; savings the equilibrating variable
* EITHER the investment volume scaling factor is fixed

* IADJ.FX         = IADJ0 ;

* OR the investment expenditure is fixed

* INVEST.FX       = INVEST0 ;
```

$$TOTSAV = INVEST + WALRAS$$ **I_S balance**

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Closure: Government 1

```
* ## GOVT CLOSURE RULES
* Tax rates & Government consumption fixed,
* Government Savings the equilibrating variable

* Tax rate scaling factors
 TEADJ.FX          = TEADJ0 ;
 TMADJ.FX          = TMADJ0 ;
 TSADJ.FX          = TSADJ0 ;
 TXADJ.FX          = TXADJ0 ;
 TYHADJ.FX         = TYHADJ0 ;

* Government expenditure - fix volume or nominal
 QGDADJ.FX         = QGDADJ0 ;
* EG.FX            = EG0 ;

* alternatively, fix the internal balance
* KAPGOV.FX        = KAPGOV0 ;
```

Code example

$$PE_c = pwe_c * ER * (1 - TEADJ * te_c)$$

$$KAPGOV = YG - EG$$

Internal balance

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Closure: Government 2

```
* ## GOVT CLOSURE RULES
* Tax rates & Government consumption fixed,
* Government Savings the equilibrating variable

* Tax rate scaling factors
 TEADJ.FX          = TEADJ0 ;
 TMADJ.FX          = TMADJ0 ;
 TSADJ.FX          = TSADJ0 ;
 TXADJ.FX          = TXADJ0 ;
 TYHADJ.FX         = TYHADJ0 ;

* Government expenditure - fix volume or nominal
 QGDADJ.FX         = QGDADJ0 ;
 EG.FX             = EG0 ;

* alternatively, fix the internal balance
 KAPGOV.FX         = KAPGOV0 ;
```

Code example

$$PE_c = pwe_c * ER * (1 - TEADJ * te_c)$$

Flex EG to equilibrate

$$KAPGOV = YG - EG$$

Internal balance

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Closure: Government 3

```
* ## GOVT CLOSURE RULES
* Tax rates & Government consumption fixed,
* Government Savings the equilibrating variable

* Tax rate scaling factors
 TEADJ.FX          = TEADJ0 ;
 TMADJ.FX          = TMADJ0 ;
 TSADJ.FX          = TSADJ0 ;
 TXADJ.FX          = TXADJ0 ;
* TYHADJ.FX         = TYHADJ0 ;

* Government expenditure - fix volume or nominal
 QGDADJ.FX         = QGDADJ0 ;
* EG.FX            = EG0 ;

* alternatively, fix the internal balance
 KAPGOV.FX        = KAPGOV0 ;
```

Code example

$PE_c = pwe_c * ER * (1 - TEADJ * te_c)$

Flex TYHADJ to equilibrate

$KAPGOV = YG - EG$

Internal balance

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Why Use Scaling Factors?

- Tax rates are parameters in this model
  - therefore tax rates cannot be target variables
  - but 'optimal' tax rates are policy objectives
- Models are square - variable & equation counts equate
  - multiple tax rates
  - single target variables
  - must maintain equation and variable counts
- Simplify simulations
  - tax rate and other adjusters exist **SOLELY** to aid simulations

Fix *KAPGOV* : Flex *T*(c)*

Fix 1 variable : Flex *c* variables

→failure

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Closure: Numéraire

```
## MISCELLANEOUS FIXED VARIABLES
* To use CPI as the numeraire fix CPI

 CPI.FX            = CPI0 ;

* For simple numeraire CHECK use CPI0 * 2

* CPI.FX            = CPI0 * 2 ;

* To use PPI as the numeraire fix PPI

* PPI.FX           = PPI0 ;
```

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Market clearing options

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Market Clearing: Equations

$$FS_f = \sum_a FD_{f,a}$$

Factor market

$$QQ_c = QINTD_c + \sum_h QCD_{c,h} + QGD_c + QINVD_c$$

Commodity market

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Clearing: Factor Market

```
*## FACTOR MARKET CLEARING

* Basic Factor Market Closure
* all factors are mobile
*$ontext

 FS.FX(f)                 = FS0(f) ;
 WFDIST.FX(f,a)           = WFDIST0(f,a) ;
 WF.LO(f)                 = -inf ;
 WF.UP(f)                 = +inf ;

*$offtext
```

Full employment and all factors mobile

$$FS_f = \sum_a FD_{f,a}$$

Factor market

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Clearing: Factor Market

```
  FS.FX("fuskl")                = FS0("fuskl") ;
  WFDIST.FX("fuskl",a)          = WFDIST0("fuskl",a) ;
  WF.LO("fuskl")                = -inf ;
  WF.UP("fuskl")                = +inf ;
*  WFDIST.FX("fuskl","aserv")   = WFDIST0("fuskl","aserv") ;
*  FS.FX("fuskl")               = FS0("fuskl") ;
*  FD.FX("fuskl",a)             = FD0("fuskl",a) ;
*  WF.FX("fuskl")               = WF0("fuskl") ;
*  FS.LO("fuskl")               = -inf ;
*  FS.UP("fuskl")               = +inf ;
```

Unskilled labour: Fully employed and fully mobile

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Surplus Unskilled Labour

```
*  FS.FX("fuskl")                = FS0("fuskl") ;
  WFDIST.FX("fuskl",a)          = WFDIST0("fuskl",a) ;
  WF.LO("fuskl")                = -inf ;
  WF.UP("fuskl")                = +inf ;
*  WFDIST.FX("fuskl","aserv")   = WFDIST0("fuskl","aserv") ;
*  FS.FX("fuskl")               = FS0("fuskl") ;
*  FD.FX("fuskl",a)             = FD0("fuskl",a) ;
  WF.FX("fuskl")                = WF0("fuskl") ;
  FS.LO("fuskl")                = -inf ;
  FS.UP("fuskl")                = +inf ;
```

Unskilled labour: Surplus and fully mobile

Fix one: Flex one

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The End