A 1*2*3 Open Economy Model with R23 Data

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Outline

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R_123: Data & Behaviour

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Data: Social Accounting Matrix

	Commodities	Activities	Factors	Households	Govt	Investment	Rest of World	Totals
Commodities	0.0	8,963.8	0.0	4,865.4	1,481.2	2,401.3	1,809.7	19,521.4
Activities	17,069.2	0.0	0.0	0.0	0.0	0.0	0.0	17,069.2
Factors	0.0	8,002.7	0.0	0.0	0.0	0.0	140.1	8,142.8
Households	0.0	0.0	7,083.1	0.0	0.0	0.0	-65.4	7,017.7
Government	428.6	102.7	0.0	1,560.4	0.0	0.0	20.3	2,112.0
Savings	0.0	0.0	706.4	592.0	610.5	0.0	492.4	2,401.3
Rest of World	2,023.6	0.0	353.3	0.0	0.0	0.0	0.0	0.0
Totals	19,521.4	17,069.2	8,142.8	7,017.7	2,112.0	2,401.3	0.0	0.0

Australia: Aggregated from R23 Database

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Behaviour

	Commodities	Activities	Factors	Households	Government	Investment	Rest of World	Totals	
Commodities	0	Leontief Input-Output Coefficient	0	Consumption expenditure	Fixed Exogenously	Fixed Exogenously	Commodity Export	Commodity Demand	Consumer Commodity Price
Activities	Total Supply from Domestic Production	0	0	0	0	0	0	CD Prodn Function	Activity Price
Factors	0	Factor Demands	0	0	0	0	Factor Income from RoW	Factor Income	
Households	0	0	Fixed Shares of Factor Income	0	0	0	Net Remittance to Households from RoW	Household Income	
Government	Sales Tax, Import Duty and Export Tax	Production Taxes	0	Direct Taxes on Household Income	0	0	Net Remittance to Government from RoW	Government Income	
Saving	0	Depreciation	0	Household Savings	Government Savings (Residual)	0	Current Account 'Deficit	Total Savings	
Rest of World	Commodity Imports	0	Fixed Shares of Factor Income	0	0	0	0	Total 'Expenditure' Abroad	
Totals	Commodity Supply	Activity Input	Factor Expenditure	Household Expenditure	Government Expenditure	Total Investment	Total 'Income' from Abroad		
	Producer Commodity Price	Value Added Prices							
	Domestic and World Price for Imports								

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Labels & Transactions

	Commodities	Activities	Factors	Households	Government	Investment	RoW
Commodities	0	$(PQD*QINTD)$	0	$(PQD*QCD)$	$(PQD*QGD)$	$(PQD*QINVD)$	$\begin{pmatrix} pwe*QE \\ *ER \end{pmatrix}$
Activities	$(PDS*QDS)$	0	0	0	0	0	0
Factors	0	(WF_f*FD_f)	0	0	0	0	$\begin{pmatrix} factwor_f \\ *ER \end{pmatrix}$
Households	0	0	$\sum_f \begin{pmatrix} hovash_f \\ *YF_f \end{pmatrix}$	0	0	0	$\begin{pmatrix} howor \\ *ER \end{pmatrix}$
Government	$(TS*PQ*QQ)$ $\begin{pmatrix} TM*pwm \\ *QM*ER \end{pmatrix}$ $\begin{pmatrix} TE*pwe \\ *QE*ER \end{pmatrix}$	$\begin{pmatrix} TX* \\ PX*QX \end{pmatrix}$	0	$(TYH*YH)$	0	0	$\begin{pmatrix} govwor \\ *ER \end{pmatrix}$
Saving	0	0	0	$\begin{matrix} (YH*(1-TYH)) \\ *SHH \end{matrix}$	$(YG-EG)$	0	$(KAPWOR*ER)$
Rest of World	$\begin{pmatrix} pwm*QM \\ *ER \end{pmatrix}$	0	$\begin{pmatrix} factwor_f \\ *YF_f \end{pmatrix}$	0	0	0	0
Total	$(PQ*QQ)$	$(PX*QX)$	YF_f	YH	YG	$INVEST$	0

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R_123: Price & Quantity Systems

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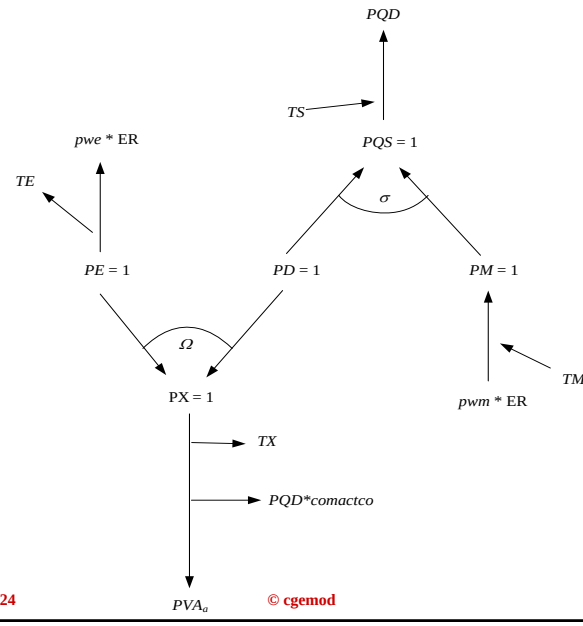
Price System



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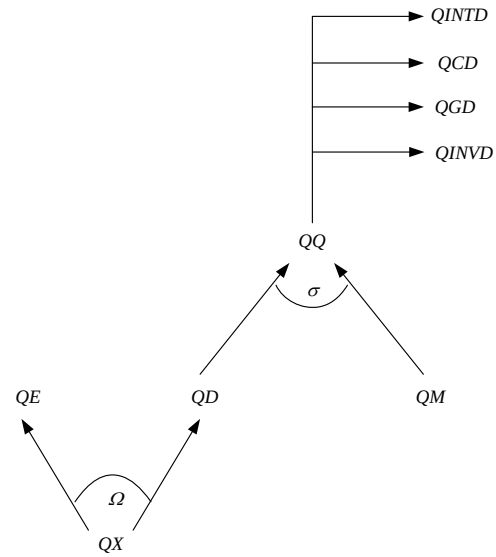
Quantity System



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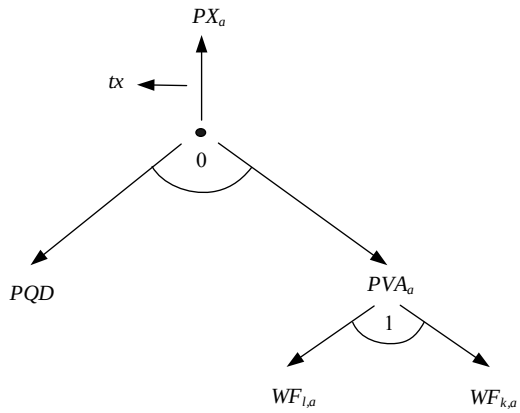
Production System: Prices



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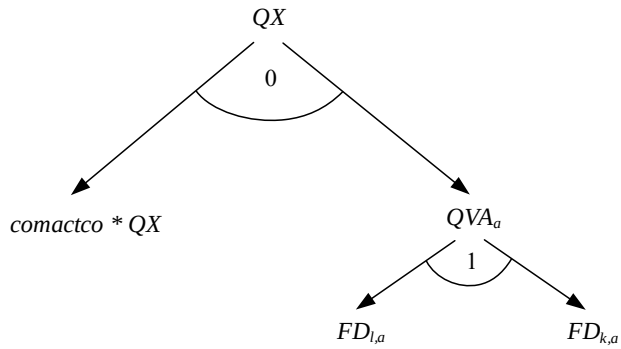
Production System: Quantities



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R_123 Model

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R_123 Model: Features

Trade: Armington 'insight'
Imports – CES. Exports - CET

Output: $QX = f(a, FD_L, FD_K)$
Factor supply → capacity

Government: Active
5 taxes → price 'wedges', consumes

Investment: Active
Savings → 3 sources, consumes

Household: Active
Pays income taxes, saves, consumes

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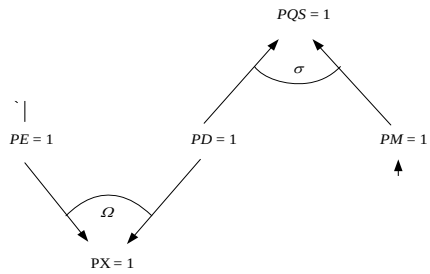
Price Normalisation & Numéraire

- Normalise on BASIC prices
- Numéraire – *CPI* (*PQ.FX*)
- Exchange rate – *ER* = 1



$PD = PM = PE = 1$

$\therefore PQS = PX = 1$

~~*iff* $ER = 1$~~

$\therefore pwm = pwe = 1$

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Price Block

Small country assumption

$PM = pwm * ER * (1 + TM)$ World price of imports exogenous

$PE = pwe * ER * (1 - TE)$ World price of exports exogenous

(Paasche) Quantity Price Indices

$$PQS = \frac{PD * QD + PM * QM}{QQ}$$ Basic price

$$PX = \frac{PD * QD + PE * QE}{QX}$$ 'Producer' price

Purchaser Prices

$PQD = PQS * (1 + TS)$ Purchaser price

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R_123 Model Behaviour

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Supply Block

$$QX = at\left(\gamma * QE^{rhot} + (1-\gamma) * QD^{rhot}\right)^{\frac{1}{rhot}}$$

ppf – concave to origin

$$\frac{QE}{QD} = \left(\frac{PE}{PD} * \frac{(1-\gamma)}{\gamma}\right)^{\frac{1}{(rhot-1)}}$$

1st Order condition for output mix

$$QQ = ac\left(\delta * QM^{-rhoc} + (1-\delta) * QD^{-rhoc}\right)^{-\frac{1}{rhoc}}$$

cpf – convex to origin

$$\frac{QM}{QD} = \left(\frac{PD}{PM} * \frac{\delta}{(1-\delta)}\right)^{\frac{1}{(1+rhoc)}}$$

1st Order condition for 'input' mix

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Production Block

$$PVA = \left(PX * (1-TX)\right) - \left(PQD * comactco\right)$$

Price definition

$$QX = adcd * \prod_f \left(FD_f\right)^{\alpha_f}$$

Production function

$$FD_f = \frac{QX * PVA * \alpha_f}{WF_f}$$

1st Order Condition

$$QINTD = comactco * QX$$

Intermediate Input Demand

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Factor Block

$$YF_f = (WF_f * FD_f) + (factwor_f * ER)$$

Factor Incomes

Incomes from aboard

$$YFWOR_f = worvash_f * YF_f$$

Factor Expenditure

Payments aboard

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Household Block

$$YH = \left(\sum_f hvash_f * YF_f\right) + (howor * ER)$$

Household Income

NET Remittances

After tax

$$PQD * QCD = \left((YH * (1 - TYH)) * (1 - SHH)\right)$$

Household Consumption

Equilibrium condition
Complete Demand System

After tax & savings

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Government Block

$$YG = (TM * pwm * ER * QM) + (TE * pwe * ER * QE) + (TS * PQS * QQ) + (TX * PX * QX)$$

Ad valorem tax variables

Government Income

$$+ (TYH * YH) + (govwor * ER)$$

'quantity' tax variable

NET Transfers

$$EG = (QGD * PQD)$$

Government Consumption

$$KAPGOV = YG - EG$$

Equilibrium condition

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Savings Investment Account Block

$$TOTSAV = ((YH * (1 - TYH)) * (SHH)) + KAPGOV + (KAPWOR * ER)$$

Savings Income

$$INVEST = (PQD * QINVD)$$

Investment Expenditures

$$TOTSAV = INVEST + WALRAS$$

Equilibrium condition

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R_123: Market Clearing & Macroeconomic Closure

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Market Clearing Block

$FS_f = FD_f$

Factor Supply = Demand

Scale of production

$QQ = QINTD + QCD + QGD + QINVD$

Commodity Supply = Demand

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Market Clearing Block

$$KAPGOV = YG - EG$$

Equilibrium condition

$$TOTSAV = INVEST + WALRAS$$

Equilibrium condition

$$KAPWOR = (pwm * QM) + \left(\sum_f \frac{YFWOR_f}{ER}\right) - (pwe * QE) - \left(\sum_f factwor_f\right) - howor - govwor$$

Current Acc balance

Current Account
In Foreign Currency Units

NB: Trade balance
= Imports - Exports

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Basic Macroeconomic Closure

$$KAPWOR = \overline{KAPWOR}$$

Trade balance

$$SHH = \overline{SHH}$$

Savings rate fixed

$$TM = \overline{TM}, TS = \overline{TS}, TE = \overline{TE},$$
$$TX = \overline{TX}, TYH = \overline{TYH}$$

Tax Rates fixed

$$PQD = \overline{PQD}$$

***CPI* - numéraire**

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Equation & Variable Counting

For you to work out this time

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The End

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