**AD MATH for Market Mode**

X = Spending [aka GDP]

Y = Income

Cd = Domestic Consumption

S = Savings

F = Imports

Kf = foreign capital flows,

E = Exports

I = Investment

G = Gov’t Purchases

Tg = Gross Taxes

TP = Transfer Payments,

Tn = net Taxes = Tg – TP

BB = Gov’t Budget Balance = -Deficit

dMD (or MD) = change of Money Demand

dMS (or MS) = Change of Money Supply

All values are nominal

ir = interest rate

ir0 = initial default value

i = ir – ir0

subscript ‘i’ = effect of interest rate

er= exchange rate

er0 = initial default value

e = er – er0

subscript e = effect of exchange rate

subscript a = autonomous value

**Equations**

S = Sint + Si\*(ir-ir0) +Sy\*Y[[1]](#footnote-1) S = Sint + Si\*i + Sy\*Y

F = Fa + Fe\*(er-er0) + Fy\*Y F = Fa + Fe\*e + Fy\*Y

Kf = Ka + Ki⋅(ir-ir0) + Ke⋅(e-e0). Kf = Ka + Ki\*i + Ke\*e

E = Ea + Ee\*(er-er0) E + Ea + Ee\*e

I = Ia + Ii\*(ir-ir0) I = Ia + Ii\*i

dMD = dMDa + dMDi\*(ir-ir0) + dMDy\*Y dMD = dMDa + dMDi\*i + dMDy\*Y

Tn = Tga + Tgy\*Y – TP + Ty\*Y

BB = Tn - G

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | a | i | e | Y |
| S = | Sint | Si |  | Sy |
| F = | Fa |  | Fe | Fy |
| Tg = | Tga |  |  | Tgy |
| E = | Ea |  | Ee |  |
| I = | Ia | Ii |  |  |
| Kf = | Ka | Ki | Ke |  |
| dMD = | dMDa | dMDi |  | dMDy |

**Default Values**

All the ‘a’ values are initially 0

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Effects** | Cd | S | I | F | E | K | Tn | dMD |
| Interest Rate | -20 | 20 | -30 |   |   | 40 |   | 100 |
| Exchange Rate |   |   |   | 20 | -30 | -40 |   |   |
| Income | 0.5 | 0.2 |   | 0.1 |   |   | 0.2 | -0.25 |

All of the green values can be user set. I think a typical user would find acceptable values for these parameters (perhaps the defaults) and then stick with them. Each of the variables has a component – subscripted ‘a’ – which can be changed by the user. Changing these values is a principle function of the program. The parameters for Cd cannot be user-changed. Cd is the computed residual. Ki, Ke and dMDi can be set equal to 0 by pressing a button

**SOLVING FOR e and i**

In this calculation, i and e denote ir – ir0 and er – er0, respectively

The model is a system of two equations in two variables i and e. The equations are the equilibrium conditions for the Credit and Foreign Exchange Markets. The equations can be solved using (for instance) Cramer’s Rule to produce the equilibrium values of exchange rates and interest rates. With these and all the parameters, the values of all variables can be had. (In the Excel program CirF\_Market Mode this calculation is in the tab “Calculations”)

**Foreign Exchange Equilibrium is:** F = E + K. That is …

Fa – Ea – Ka + Fy\*Y = Ki\*i + (Ee + Ke – Fe)\*e

**Credit Market Equilibrium is:** MD + MS + S + Kf + BB = I. That is …

MDa + MSa + Sint + Kfa + Tg - TP – G – Ia + (Sy + Ty)\*Y = (Ii –MDi –Si – Kfi)\*i – Kfe\*e

EXOGENOUS, for user input

ΔMS

G, Tg, TP

Stp and Stg.

All the ‘a” subscripted variables

All the ‘i” and ‘e’ subscripted parameters. (Again, I think these parameters should be established and left alone)

CANNOT BE EXOGENOUSLY CHANGED

**Cd** = Y - S - F – Tn is an endogenous residual; it cannot be exogenously changed

 (This may have been a bad choice S as the residual makes more sense)

**X** = Cd + E + I + G is an endogenous residual; it cannot be exogenously changed

**Y.** Income (Y) always functions as an exogenous variable. This is clearly a change from the usual models in which Y is THE endogenous variable. The program allows one to manually endogenizes Y.

[~~The ‘i’ and ‘e’ variables can be changed in two ways. If changed on the diagram, the new value is used. If changed under the table labeled, “2~~~~nd~~ ~~Effects” two curves are drawn, one with each of the slopes.]~~ This functionality is suspect and best ignored.

CONSTRAINTS

1. MD + MS + S + Kf + BB = I. Credit Market Equilibrium

2. F = E + Kf

3. X = Cd + E + I + G

4. Cd = Y - S - F – Tn

5. BB = Tn - G

Solving system this produces: X = Y + MD(i, e) + MS.

MD = [Ia – Sint – MS – Ka – Tga – TP – G] +(Sy – Ty)\*Y +(Ii – Si – Ki)\*i – Ke\*e

1. where: Sint = (Sa + Stg\*Tg + Stp\*TP)

Stp = the marginal propensity to save out of a transfer payment

Stg = the marginal propensity to save out of gross taxes [↑](#footnote-ref-1)