

\$TITLE: M10-1.GMS: steady state capital stock, comparative steady-states

\$ONTEXT

"closure rule": instead of the capital stock being fixed (quantity closure), the stock adjusts to satisfy the steady-state relationship between the rental rate and the price of producing new capital (price closure):

delta = depreciation rate

rho = rate of time preference

rental rate = $(1 - (1 - \text{delta})/(1 + \text{rho})) * (\text{price of new capital})$

this is done via a subsidy to capital use that creates the wedge

subsidy = $(1 - \text{delta})/(1 + \text{rho})$

	Production Sectors				Consumers		
Markets		X	Y	K	W		CONS
PX		100			-100		
PY			100		-100		
PW					200		-200
PL		- 40	-60	-60			160
PK		-120	-80	60			140
SUB		60	40				-100

\$OFFTEXT

PARAMETERS

RHO Time preference parameter
DELTA Depreciation rate
TAU Effective capital use subsidy
KTAX Tax on new capital production
NEWCAP New capital stock after counterfactual (= 1 initially);

RHO = 0.4;
DELTA = 0.3;
TAU = - (1 - DELTA)/(1 + RHO);
KTAX = 0;

NONNEGATIVE VARIABLES

X Activity level for sector X
Y Activity level for sector Y
W Activity level for sector W (Hicksian welfare index)
K Capital stock index

PX Price index for commodity X
PY Price index for commodity Y
PL Price index for primary factor L
PK Price index for primary factor K
PW Price index for welfare (expenditure function)

CONS Income definition for CONS
 KFORWRD Capital stock from previous period;

EQUATIONS

PRF_X Zero profit for sector X
 PRF_Y Zero profit for sector Y
 PRF_W Zero profit for sector W (Hicksian welfare index)
 PRF_K Zero profit for capital index

MKT_X Supply-demand balance for commodity X
 MKT_Y Supply-demand balance for commodity Y
 MKT_L Supply-demand balance for primary factor L
 MKT_K Supply-demand balance for factor K
 MKT_W Supply-demand balance for aggregate demand

I_CONS Income definition for CONS
 A_KFORWRD Auxiliary equation to determine the carry forward;

* *Zero profit conditions:*

PRF_X.. 100 * PL**0.4 * (PK*(1+TAU)/0.5)**0.6 =G= 100 * PX;

PRF_Y.. 100 * PL**0.6 * (PK*(1+TAU)/0.5)**0.4 =G= 100 * PY;

PRF_W.. 200 * PX**0.5 * PY**0.5 =G= 200 * PW;


```
MODEL ALGEBRAIC /PRF_X.X, PRF_Y.Y, PRF_W.W, PRF_K.K,  
                MKT_X.PX, MKT_Y.PY, MKT_L.PL, MKT_K.PK, MKT_W.PW,  
                I_CONS.CONS, A_KFORWRD.KFORWRD/;
```

```
X.L      =1;
```

```
Y.L      =1;
```

```
W.L      =1;
```

```
K.L      =1;
```

```
PX.L     =1;
```

```
PY.L     =1;
```

```
PK.L     =1;
```

```
PW.FX    =1;
```

```
PL.L     =1;
```

```
CONS.L   =200;
```

```
KFORWRD.L = 1;
```

```
ALGEBRAIC.ITERLIM = 0;
```

```
SOLVE ALGEBRAIC USING MCP;
```

```
ALGEBRAIC.ITERLIM = 2000;
```

```
SOLVE ALGEBRAIC USING MCP;
```

** Raise the rate of time preference from 0.4 to 0.6:*

```
RHO = 0.6;  
TAU = - (1 - DELTA)/(1 + RHO);
```

```
SOLVE ALGEBRAIC USING MCP;
```

```
NEWCAP = K.L/60;  
DISPLAY NEWCAP;
```

```
* Set rho back to 0.4, tax new capital at 0.20
```

```
RHO = 0.4;  
TAU = - (1 - DELTA)/(1 + RHO);
```

```
KTAX = 0.20;
```

```
SOLVE ALGEBRAIC USING MCP;
```

```
NEWCAP = K.L/60;  
DISPLAY NEWCAP;
```