POLICY FUNCTION FOR JEDC PROBLEM A **1.12.07**

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This note explains the proc jedcS7_POLF_A.m that provides a policy function for JEDC Problem A.

Let N be the number of countries, and let $w_t \equiv [c_t; L_t; \lambda_t; k_{t+1}; I_t]$ be $(4N+1)\times 1$ vector of variables determined at date t. c_t, L_t, k_{t+1}, I_t : Nx1 vectors of countries' consumptions, labor supplies, end-of-period capital stocks, and capital investments at date t; λ_t : a scalar that represents marginal utility of consumption at t (see Michel Juillard's May 2007 notes on Problem A). The model determines w_t is a function of the vector of capital stocks at the end of period t, k_t , and of the Nx1 vector of date t productivities, θ_t :

$$w_t = f(z_t), \quad z_t \equiv [k_t; \theta_t] \qquad (1)$$

The enclosed MATLAB **jedcS7_POLF_A.m** approximates this policy function by a second order Taylor expansion:

$$dw_t^j = HH0(j,:) + HH1(j,:)dz_t + .5\,dz_t'\,squeeze(HH2(j,:,:))\,dz_t, \qquad \text{j=1,..,4N+1}$$

where $HH0, HH1, HH2$ are arrays of dimensions (4N+1) x 1, (4N+1) x 2N and (4NC+1) x 2N x 2N, respectively. w_t^j is the j-th element of the vector w_t. $dw_t \equiv w_t - w^{SS}$, $dz_t \equiv z_t - z^{SS}$ denote deviations of w_t and z_t from steady state (SS) values.

We solved each of the 30 different model variants. The HH0, HH1, HH2 vectors/matrices of these variants are stored in the enclosed 30 MATLAB *.MAT files.

The file KKKLOG_miNj.MAT (for i=1,2,..,8 and j=2,4,6,8,10) pertains to model Ai with j countries. It contains the following information: HH, HH0, HH1, HH2, MODEL, NC, wSS, zSS. "MODEL" is a number that indexes the model (eg, for model A7: MODEL=7), and NC is the number of countries. wSS and zSS are the steady state vectors w^{SS}, z^{SS} (see above).

For example, KKKLOG_m**7**N**4**.MAT pertains to model A7 with N=4 countries.

The first part of the file name KKK**LOG** **Fehler! Textmarke nicht definiert.** indicates that the approxima**Fehler! Textmarke nicht definiert.**tion has been taken in terms of (natural) logs, i.e. the above variables $w_t \equiv [c_t; L_t; \lambda_t; k_{t+1}; I_t]$, $z_t \equiv [k_t; \theta_t]$ all are logged quantities (eg: c_t is the vector of log consumptions).

KKKLOG_m7N4.MAT was generated as follows, after solving model A7 with N=4:

```
save KKKLOG_m7N4 HH0 HH1 HH2 MODEL NC wSS zSS
```

To access the stored information for model A7 with 4 countries, copy the file KKKLOG_m7N4.MAT to your computer.

Then load the `HH0 HH1 HH2 MODEL NC wSS zSS` for that model:

```
load KKKLOG_m7N4
```

Use `jedcS7_POLF_A.m` to evaluate the approximate policy function: $w_t = f(z_t)$.

For example, in order to evaluate the function for a random state vector dz, we define

```
dz=randn(2*NC,1);
```

The following command computes dw:

```
dw=jedcS7_POLF_A(dz,HH0,HH1,HH2)
```

NB The input dz and the output dw of jedcS7_POLF_A are quantities expressed as differences from the steady state. To express in levels, use z=dz+zSS; w=dw+wSS.