Hi Guys,

I have a few queries (see boldface below) about programming in Dynare where the shocks are I(1).

I understand that the system of equations needs to be written in terms of stationary variables before approximating.

Below I have outlined a simplified version of the model I want to solve using Dynare. I have also given you some of the Dynare code that I intend using.

A two-county model

Notation

C_t^j is consumption of good *j* at time *t*.

P_t^j is the price of good *j* at time *t*.

M_t^j is the nominal money supply of country *j* at time *t*.

i_t^j is the nominal interest rate in country *j* at time *t*.

Lowercase variables (except i_t^j) logs.

Exogenous shocks

Domestic and Foreign real consumption growth equations

$$\Delta c_{t+1}^j = (1-\rho_\mu)\overline{\mu} + \rho_\mu \Delta c_t^j + v_{t+1}^j, \quad v_{t+1}^j \sim N(0,\sigma_v^2), \quad j=1,2 \tag{1}$$

Domestic and Foreign nominal money growth equations

$$\Delta m_{t+1}^j = (1-\rho_\pi)\overline{\pi} + \rho_\pi \Delta m_t^j + u_{t+1}^j, \quad u_{t+1}^j \sim N(0,\sigma_u^2), \quad j=1,2 \tag{2}$$

The unconditional means of consumption and money growth are defined as $\overline{\mu}$ and $\overline{\pi}$ respectively.

The variances of shocks to consumption and money growth are defined as σ_v^2 and σ_u^2 respectively.

The shocks to consumption and money growth are uncorrelated

Marginal utility wrt C

$$MU_t^j = \left(C_t^j\right)^{\eta-1}\left[\left(\left(C_t^j\right)^\eta + \omega\left(\frac{M_t^j}{P_t^j}\right)^\eta\right)^{\frac{1-\sigma-\eta}{\eta}}\right], \quad j=1,2 \tag{3}$$

First order conditions
Domestic and Foreign Euler equations

$$\frac{1}{1+i_t^j} = E_t\left[\beta \frac{MU_{t+1}^j}{MU_t^j}\frac{P_t^j}{P_{t+1}^j}\right], \quad j=1,2 \tag{4}$$

Domestic and Real Money Demand

$$\frac{M_t^j}{P_t^j} = \left[\frac{1}{\omega}\frac{i_t^j}{1+i_t^j}\right]^{\frac{1}{\eta-1}} C_t^j, \quad j=1,2 \tag{5}$$

Substituting (3) and (5) into (4) gives

$$\frac{1}{1+i_t^j} = E_t\left[\beta\left(\frac{C_{t+1}^j}{C_t^j}\right)^{1-\sigma}\left(\frac{M_{t+1}^j}{M_t^j}\right)^{-1}\left(\frac{\left(1+\left[\frac{1}{\omega}\frac{i_{t+1}^j}{1+i_{t+1}^j}\right]^{\frac{\eta}{\eta-1}}\right)^{\frac{1-\sigma-\eta}{\eta}}\left[\frac{1}{\omega}\frac{i_{t+1}^j}{1+i_{t+1}^j}\right]^{\frac{1}{\eta-1}}}{\left(1+\left[\frac{1}{\omega}\frac{i_t^j}{1+i_t^j}\right]^{\frac{\eta}{\eta-1}}\right)^{\frac{1-\sigma-\eta}{\eta}}\left[\frac{1}{\omega}\frac{i_t^j}{1+i_t^j}\right]^{\frac{1}{\eta-1}}}\right)\right], \quad j=1,2 \tag{6}$$

Real Exchange rate

$$R_t = \frac{MU_t^2}{MU_t^1} \tag{7}$$

Nominal Exchange Rate

$$S_t = R_t\frac{P_t^1}{P_t^2} \tag{8}$$

Nominal Exchange Rate Depreciation

$$DS_t = \frac{S_t}{S_{t-1}} \tag{9}$$

Real Exchange Rate Depreciation

$$DR_t = \frac{R_t}{R_{t-1}} \tag{10}$$

Forward Exchange Rate Premium

$$\frac{F_t}{S_t} = \frac{1+i_t^1}{1+i_t^2} \tag{11}$$

Forward Profit from Speculation

$$FP_t = \frac{F_{t-1}}{S_t} \qquad (12)$$

My queries are

Since equations (7)-(12) do not need to be approximated is it possible use Dynare to solve and simulate the nominal interest rates in (6) and then outside of the stoch_simul command integrate the growth processes to generate C_t^j and M_t^j calculate P_t^j from (5) and all of the other variables?

If so how do I retrieve the simulated interest rates and the exogenous variables?

Here is some of the dynare code

```
model;
i1/(1+i1)=beta*exp(dc1)^(1-sigma)/exp(dm1)*(expression with interest rates);
i2/(1+i2)=beta*exp(dc2)^(1-sigma)/exp(dm2)*(expression with interest rates);
dc1   = (1-rho_mu)* (1+mu_bar) + rho_mu*dc1(-1) + v1;
dc2   = (1-rho_mu)* (1+mu_bar) + rho_mu*dc2(-1) + v2;
dm1   = (1-rho_pie)* (1+pie_bar) + rho_pie*dm1(-1)+ u1;
dm2   = (1-rho_pie)* (1+pie_bar) + rho_pie*dm2(-1)+ u2;
end;

initval;
i1 =  (1+pie_bar)/(1+mu_bar)^(1-sigma)/beta - 1;
i2 =  (1+pie_bar)/(1+mu_bar)^(1-sigma)/beta - 1;
dc1 = 1+mu_bar;
dc2 = 1+mu_bar;
dm1 = 1+pie_bar;
dm2 = 1+pie_bar;
v1 = 0;
v2 = 0;
u1 = 0;
u2 = 0;
end;

steady;

check;

shocks;
var v1 = sigma_dc1^2;
var v2 = sigma_dc2^2;
var u1 = sigma_dm1^2;
var u2 = sigma_dm2^2;
end;

stoch_simul(periods=2100);
```

Is this how I retrieve simulated values after the stoch_simul command?

```
c1 = c1(-1) + dc1;
c2 = c2(-1) + dc2;
m1 = m1(-1) + dm1;
m2 = m2(-1) + dm2;
p1 = log((i1/(omega*(1+i1))^(1/(1-eta))) + m1 – c1;
p2 = log((i2/(omega*(1+i2))^(1/(1-eta))) + m2 – c2;

muc1 = exp(c1)^(eta-1)*(exp(c1)^eta+omega*exp(m1-p1)^eta)^((1-sigma-
eta)/eta);
muc2 = exp(c2)^(eta-1)*(exp(c2)^eta+omega*exp(m2-p2)^eta)^((1-sigma-
eta)/eta);

r  = log(muc2)/log(muc1);
s     = r + p1 - p2;
sdep  = s - s(-1);
rdep  = r - r(-1);
fprem = i1 - i2;
fprof = fprem(-1) - s;
```