Dynare model fil

Declare endogenou

Declare exogenou

Declare

paramete

model

Solve for th

Set the shock

Solve for 1

Dynamic Macroeconomics using Matlab Seminar 4

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Declare endogenous variables Declare exogenous variables Declare parameters Declare the model equations Solve for the steady state Set the shocks Solve for the dynamics





Dynare model file

Declare endogenoi

Declare exogenor variables

Declare

Declare model

Solve for the steady state

Set the shock

► The structure of a Dynare model file (.mod)

- Declare endogenous variables
- Declare exogenous variables
- Declare parameters
- Declare the model equations
- o Ask Dynare to solve for the steady state



Declare endogenous variables

 \triangleright Note productivity z_t is treated as endogenous

Listing 1: Script

```
// (1) declare endogenous variables
3
              c, k, 1, z;
  var
```



Dynare

endogeno variables

Declare exogenous variables

Declare

Declare t

Solve for

Set the sho

Solve for the

It is the innovations ε_t that are fundamentally exogenous, given technology shock

Listing 2: Script

```
1
2 // (2) declare exogenous variables (shocks)
3
4 varexo e;
```

Declare parameters



► List of parameter names

Listing 3: Script

```
1
2 // (3) declare parameters
3
4 parameters alpha, beta, delta, sigma, phi, sigmaeps, varphi;
```

Set parameter values

Listing 4: Script

```
1
2 alpha = 0.485;
3 beta = 0.925;
4 delta = 0.078;
5 phi = 0.95;
6 sigma = 1;
7 sigmaeps = 0.01;
8 varphi = 0.397;
```

Declare

parameters



► Set parameter values

Listing 5: Script

```
1
2 alpha = 0.485;
3 beta = 0.925;
4 delta = 0.078;
5 phi = 0.95;
6 sigma = 1;
7 sigmaeps = 0.01;
8 varphi = 0.397;
```

Calibration table 1

Parameter	Meaning of parameter	Calibrate value
α	Output elasticity of capital	0.485
β	Discount factor	0.925
δ	Depreciation rate	0.078
σ	Consumption elasticity	1
Zss	Technology shock	1
ρ	Autoregressive coefficient for productivity	0.95
σ_{ε}	Shock error	0.01
φ	Labor supply elasticity	0.397

Table: Parameter values of the structural model.



nare odel file

Declare endogenous variables

Declare exogeno variable

Declare

Declare the model

equations Solve for the

Set the shock

Labor elasticity

▶ In usual notation

$$I_t^{\varphi} c_t^{\sigma} = (1 - \alpha) z_t \left(\frac{k_t}{I_t}\right)^{\alpha}$$

Listing 6: Script

```
1 // labor supply
2 exp(l)^(varphi)*exp(c)^(sigma) =
3 (1-alpha)*exp(z)*(exp(k)^(alpha))*(exp(l)^(-alpha));
```

- Variables chosen at t have no time argument
- ▶ Variables chosen at t − 1 have −1 argument
 - Variables chosen at t+1 have +1 argument

Declare the model equations



Consumption Euler equation

In usual notation

$$c_t^{-\sigma} = \beta c_{t+1}^{-\sigma} \left[\alpha z_{t+1} \left(\frac{k_{t+1}}{l_{t+1}} \right)^{\alpha - 1} + (1 - \delta) \right]$$

▶ In Dynare notation, supposing we want an approximation in logs

Listing 7: Script

```
// consumption Euler equation
2 \exp(c)^{-1}(-sigma) = beta*(exp(c(+1))^{-1}(-sigma))*
 (alpha*exp(z(+1))*(exp(k(+1))^(alpha-1))*
   (\exp(1(+1))^{(1-alpha)})+1-delta);
```

- Variables chosen at t have no time argument
- Variables chosen at t-1 have -1 argument
- Variables chosen at t+1 have +1 argument



nare odel file

Declare endogenous variables

Declare exogeno variable

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Declare the

model equations

Solve for the steady state
Set the shock

Resource constraint

▶ In usual notation

$$c_t + k_{t+1} = w_t I_t + (r_t + 1 - \delta) k_t$$

▶ In Dynare notation, supposing we want an approximation in logs

Listing 8: Script

```
1 // resource constraint
2 exp(c) + exp(k) = exp(z)*(exp(k(-1))^alpha)*
3 (exp(l)^(1-alpha))+(1-delta)*exp(k(-1));
```

- Variables chosen at t have no time argument
- ▶ Variables chosen at t-1 have -1 argument
- $\blacktriangleright \quad \text{Variables chosen at } t+1 \text{ have } +1 \text{ argument}$



Dynare

Declare endogeno

Declare exogeno

Declare

parameters Declare the

model equations

Solve for the steady state Set the shock Solve for the

Law of motion for productivity

▶ In usual notation

$$\ln z_{t+1} = \rho \ln z_t + \varepsilon_{t+1}$$

▶ In Dynare notation, supposing we want an approximation in logs

Listing 9: Script

- 1 // law of motion productivity
 2 z = phi*z(-1) + e;
- Variables chosen at t have no time argument
- Variables chosen at t − 1 have −1 argument
- ▶ Variables chosen at t+1 have +1 argument

Declare the model equations



▶ Start block with model that list equations, then end

Listing 10: Script

```
1
2
   // (4) declare the model equations
3
   model:
   // labor supply
   exp(1)^(varphi) *exp(c)^(sigma) =
    (1-alpha) \times \exp(z) \times (\exp(k)^{(alpha)}) \times (\exp(l)^{(-alpha)});
7
8
    // consumption Euler equation
    \exp(c)^{(-sigma)} = beta*(exp(c(+1))^{(-sigma)})*
10
11
    (alpha*exp(z(+1))*(exp(k(+1))^(alpha-1))*
    (\exp(1(+1))^{(1-alpha)})+1-delta);
12
13
    // resource constraint
14
    \exp(c) + \exp(k) = \exp(z) * (\exp(k(-1))^alpha) *
15
    (\exp(1)^{(1-alpha)}) + (1-delta) * \exp(k(-1));
16
17
18
19
    // law of motion productivity
    z = phi*z(-1) + e;
20
21
22
    end:
```

Declare the model equations



Oynare nodel file

Declare endogenou variables

Declare exogenor

Declare

Declare t

model equations Solve for the

steady state

Set the short

C-line Shock

Listing 11: Script

▶ Solve for steady state numerically (system of nonlinear equations)

```
1
2
3 // (5) solve the steady state
4 initval;
5 c = 0.75;
6 k = 3.5;
7 l = 0.3;
8 z = 1;
9 e = 0;
10 end;
```



Dynare model file

Declare endogeno variables

> Declare exogenou variables

Declare

Declare

equations

steady stat

Set the shocks

Solve for the

▶ Set the variance/covariance structure of shocks

Listing 12: Script

```
1 // specify variance of shocks
2
3 shocks;
4 var e = 100*sigmaeps^2;
5 end;
```



Dynare

Declare endogenou

> Declare exogenou variables

Declare

Declare t model

Solve for the

Set the sho

Solve for the dynamics

▶ Solve for coefficients, obtain moments, plot impulse responses etc

Listing 13: Script

```
1 // (6) solve the dynamics
2 stoch_simul(order=2,irf=60);
```