



Issues in DSGE modelling

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Basic issues in DSGE modeling

1. Technical issues

- Stationarity of variables,
- Rational expectations,
- Estimation procedures.

2. Theoretical issues

- Labour market imperfections,
- Financial market imperfections,
- Interaction of fiscal and monetary policy.



Stationarity of variables

Let us assume the following simplified CES production function

$$Y_t = [\omega(Z_t L_t)^\theta + (1 - \omega)(K_t)^\theta]^{1/\theta},$$

where Y_t is a production, Z_t is labour-augmenting productivity, L_t is employment, K_t capital stock, and θ is a parameter of substitution between labour and capital. Especially the parameter θ can be problematic both for estimation and solution.

- Scaling of variables: Let us divide all variables of equation by $Z_t N_t$, a productivity and population: $y_t = Y_t / Z_t N_t$, $k_t = K_t / Z_t N_t$, and $l_t = L_t / N_t$. Then the production function can be expressed

$$y_t = [\omega(l_t)^\theta + (1 - \omega)(k_t)^\theta]^{1/\theta}, \quad (1)$$

which is a stationary but definitely not a simple linear function.

- Deviations from (constant) steady states: Using the second approach, we can simply log-linearize the non-linear production function into the form

$$\hat{y}_t = \omega(\hat{z}_t + \hat{l}_t) + (1 - \omega)\hat{k}_t, \quad (2)$$



which is a standard linear equation and can be estimated simply by OLS.

It is worth noting that after log-linearization we can lose some important features from the model. However, we believe that this is a reasonable trade-off.



Rational expectations

GDP comprises from the following components

$$\hat{y}_t = \omega_{yc}\hat{c}_t + (1 - \omega_{yc})\hat{g}_t, \quad (3a)$$

$$\hat{c}_t = \omega_{cc}\hat{c}_{t-1} + (1 - \omega_{cc})E_t(\hat{c}_{t+1}) - \omega_{cr}E_t(\hat{i}_t - \hat{\pi}_{t+1}) + u_t^c, \quad (3b)$$

$$\hat{g}_t = \omega_{gg}\hat{g}_{t-1} + u_t^g. \quad (3c)$$

The Phillips curve specification is as follows

$$\hat{\pi}_t = \omega_{pc}\hat{m}c_t + \omega_{pp}\hat{\pi}_{t-1} + (1 - \omega_{pp})E_t(\hat{\pi}_{t+1}) + u_t^p, \quad (4a)$$

$$\hat{m}c_t = \omega_{my}\hat{y}_t + \omega_{mc}\hat{c}_t - \omega_{mcc}\hat{c}_{t-1} - \omega_{ma}\hat{a}_t, \quad (4b)$$

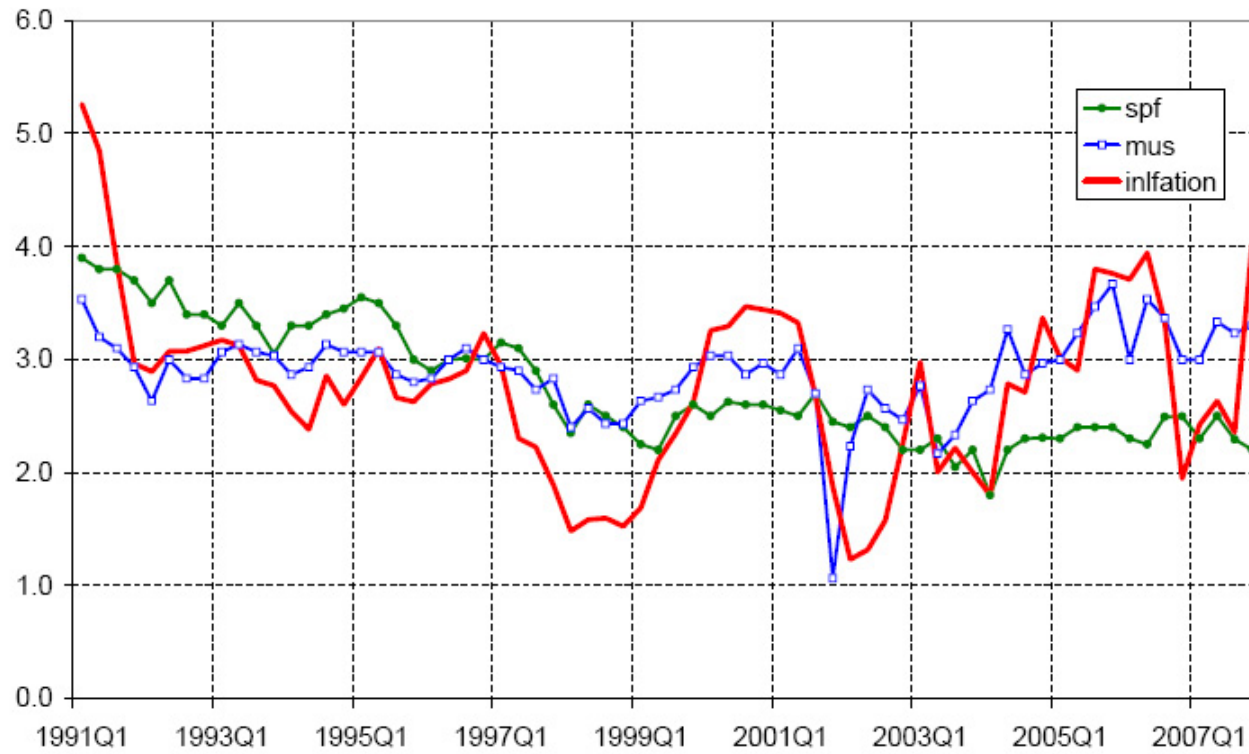
$$\hat{a}_t = \omega_{aa}\hat{a}_{t-1} + u_t^z. \quad (4c)$$

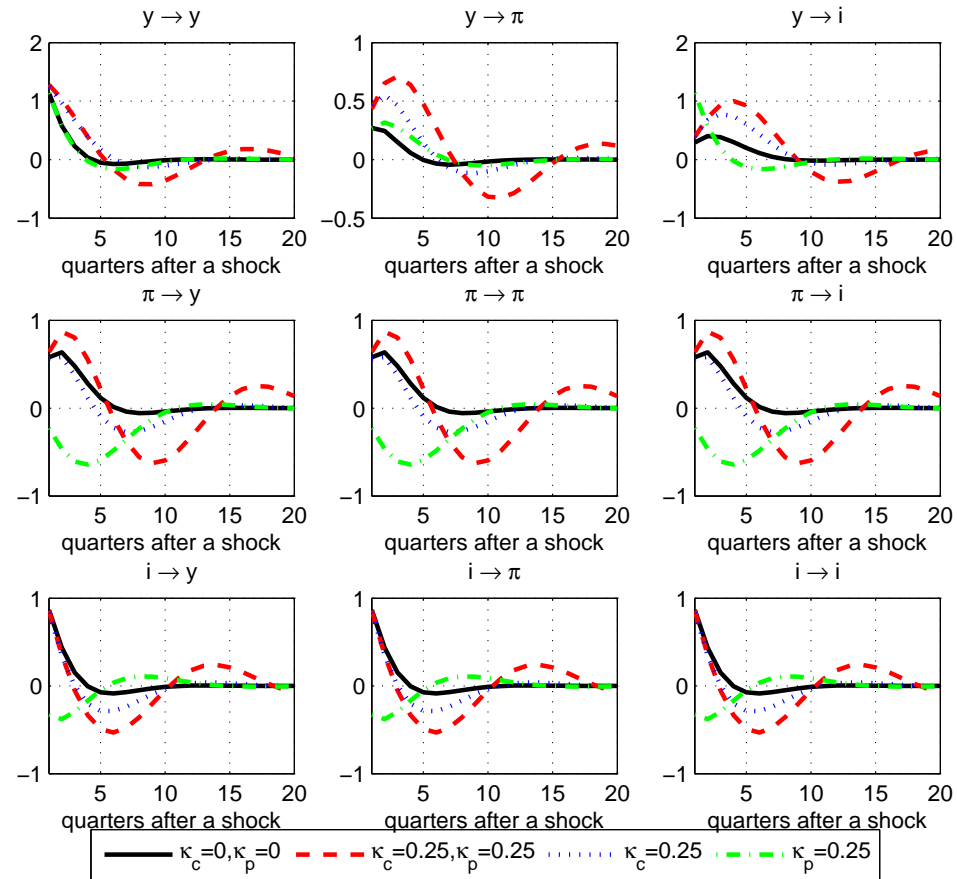
The interest rate setting is given by

$$\hat{i}_t = \omega_{i\pi}\hat{\pi}_t + \omega_{iy}\hat{y}_t + \omega_{ii}\hat{i}_{t-1} + u_t^i, \quad (5a)$$

$$(5b)$$

All the parameters ω 's are reduced form parameters and are functions of deep (structural) parameters. Now, what about if $E_t(X_{t+1}) \neq X_{t+1} + \epsilon_{t+1}$ but a fraction κ_x of agents is backward-looking in their expectations?







Estimation

- Maximum likelihood:
 - strict assumptions about a distribution of error terms,
 - no analytical solution usually available,
 - numerical differentiation \neq analytical counterpart,
 - very useful properties.
- Bayesian methods:
 - strict assumptions about a prior distribution,
 - no analytical solution usually available,
 - numerical integration for finding moments of from posterior distribution,
 - very powerful tool but...
- Simulated methods of moments/indirect inference models:
 - for models where no analytical solution is available (e.g. GMM),
 - requires “stable” moments (raw, auto, or cross ones),
 - requires a “correct” specification of the model under a simulation,
 - very flexible and powerful tool.



Labour market imperfections

There are two labour market imperfections: sticky wages and relationship between labour demand and supply.

- Sticky wages: this problem is usually solved using both adjustment cost function of Calvo type contract for wages. Both formulations lead to the same results in fact.
- The link between labour demand and supply is usually underestimated in current DSGE models. Very promising, but not without problems, is an approach based on matching functions, see **MOYEN AND SAHUC (2005)**.



Financial market imperfections

- Conducting monetary policy is based on setting short-term interest rates.
- However, there is some evidence in the literature that behaviour of agents is affected rather by (real) long-term, credit and/or deposit rates. A very nice example is the **mortgage rate** which can be fixed for several years in an individual contract.
- DSGE models usually completely ignore a problem of interest rate pass-through.
- A possible solution can be in extending DSGE models by a banking sector, see VAVRA (2008).



Interaction of fiscal and monetary policy

The main problem of standard DSGE models is that a fiscal block is usually missing. If not, it is usually some ad hoc specification but

- optimal economic policy \neq optimal monetary + optimal fiscal policy.

Moreover, an ad-hoc specified simple fiscal policy rule can constrained performance of Taylor based monetary policy rules and lead to ineffectiveness, see **ASCARI AND RANKING (2007)** for details.



The end

Thanks for your attention.