Workshop 8

Forecasting with DSGE Models

Course on Monetary and Fiscal Policy Analysis with DSGE Models (OT26.08)

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In this workshop, we will use the different forecasting alternatives available in Dynare. We will compute the unconditional forecast and the conditional forecast using the Kalman filter. To illustrate the procedure we work with a simple New Keynesian model described through the following equations:

$$c_t = -\sigma(i_t - \pi_{t+1}) + c_{t+1} + \sigma(1-\rho_g)g_t$$

$$w_t = \sigma l_t + \frac{1}{\sigma} c_t$$

$$y_t = a_t + l_t$$

$$\pi_t = \beta\pi_{t+1} + \frac{(1-\theta)(1-\theta\beta)}{\theta} mc_t$$

$$mc_t = w_t - a_t$$

$$y_t = c_t$$

$$i_t = \rho_i i_{t-1} + (1-\rho_i)[\phi_y\, y_t + \phi_\pi] + z_t$$

$$a_t = \rho_a a_{t-1} + e_t^a$$

$$g_t = \rho_g g_{t-1} + e_t^g$$

$$z_t = \rho_z z_{t-1} + e_t^z$$

$$r_t^{obs} = \bar{\pi} + \bar{g} - 400Ln(\beta) + 400 i_t$$

$$\pi_t^{obs} = \bar{\pi} + 400\pi_t$$

$$y_t^{obs} = \bar{g} + 400\,(y_t/y_{t-1})$$

The last three equations are the measurement equations. These equations relate the model variables with the observed counterparts. Note that they imply that the observable variables are annual growth rates computed at a quarterly frequency and that the nominal interest rate is the log of the annualized quarterly interest rate.

In the exercise, we use quarterly data on nominal interest rate, output growth, and CPI inflation. The data is available in the file Datos_USA.xlsx. The Dynare code `nk_closed_est.dyn` contains the model equations as well as the estimation commands.

Questions:

1. Using Excel transform the data original so that it matches the model concepts. Saved the file containing the transformed data in a file called: "TransformedData.xlsx". Two important warnings: name the variables in the Excel matching the name of the observable variables in Dynare and save the data containing the transformed variables in the current working directory.

2. Estimate the model using data from 1984Q1 to 2009Q4

```
Hint: estimation() rnom_obs pic_obs y_obs;
```

3. Plot the historical decomposition. What are the most important shocks explaining the current behavior of the economy?

```
Hint: shock_decomposition(parameter_set=posterior_mean)
rnom_obs pic_obs y_obs ;
```

4. Compute the unconditional forecast for the next 8 quarters of inflation, output and nominal interest rate. How can you explain the forecast? Does it look reasonable? Save the forecast in an Excel file and compare it with the actual value.

```
Hint: estimation(forecast=8) rnom_obs pic_obs y_obs;
```

5. Recursive forecast with Dynare. Compute 4 quarters recursive forecast starting in 2009Q4 and ending in 2012Q1.

```
Hint: estimation(forecast=4, nobs=[109:112]) rnom_obs pic_obs
y_obs;
```

Results are in oo_.RecursiveForecast.Mean.y_obs

6. Let us assume that you have available the forecast of inflation for the next three quarters and the forecast of the nominal interest rate for the next year. Table 1 contains the available forecast. You also have the uncertainty surrounding these forecasts. The forecast standard error for the nominal interest rate is 0.3 and for the inflation forecast it is 0.5. In practice, you can estimate the forecast standard errors using past forecasting performances of your alternative forecasting models.

	Inflation		Nominal interest rate
2010q1	0.005		0.107
2010q2	0.7812		0.147
2010q3	0.9764		0.157
2010q4			0.137

a. Using the Kalman filter compute the conditional forecast.

   Hint: Create two new observable variables and add the measurement equations with measurement error.

b. Compute again the conditional forecast assuming that the forecast standard errors are lower. In particular, for the nominal interest rate assume that it is 0.0001 and for the inflation rate forecast assume that it equals 0.05. Does this affect the forecast? Compare the smoothed interest rate for the period 2010q1-2010q4 with your conditioning assumptions. Look at the effect on the forecast of the other variables.

7. What would be the effect of increasing the nominal interest in 25 bps in the next quarter followed by an increased 50 bps in the subsequent quarter? Use the conditional forecast command available in Dynare.

```
Hint:
conditional_forecast_paths;
var rnom_obs;
periods 1, 2;
values 0.30, 0.807;
end;

conditional_forecast(parameter_set = posterior_mean, controlled_varexo =
(e_z), replic = 3000);

plot_conditional_forecast(periods = 10) rnom_obs pic_obs y_obs;
```