These files illustrate three methods for identification analysis using the approach in the paper. The model is taken from An and Schorfheide (2007) Econometric Reviews article.

Method (1). Using Dynare's `identification` command. See `as2007.mod` and Section 4.17 of the Dynare Reference manual written by Marco Ratto for details on the command.

(1) put Dynare on your path

(2) run `dynare as2007`

(3) rank deficiency of H means that the necessary rank condition for identification fails. Dynare shows that this is due to the exact linear dependence among the columns of H associated with the Taylor rule parameters psi1, psi2, rhor and the standard deviation of the policy shock stdr. In other words these 4 parameters cannot be identified together but if any one of them was known the remaining would be identifiable.

(4) To learn more about the collinearity patterns among the parameters (more precisely, the parameters' effects on the model solution or on the moments), change `advanced_analysis` in line 10 to 1. Run `dynare as2007` again and press ENTER when prompted. The 3 tables show, for each parameters, the sets of 1, 2, and 3 parameters it is most collinear with. Note that in the second table the last column shows 1 for the 3 Taylor rule parameters, suggesting exact collinearity among them. This is due to rounding. In fact the collinearities are 0.99996, 0.99994, and 0.99963, i.e. less than 1. To get this, change line 142 in **plot_identification.m** of Dynare's matlab folder from 10.3f to 10.5f. Note that numbers like 0.99999 are not uncommon in larger models and it is important to recognized them as smaller than 1, otherwise possible weak identification would be confused for lack of identification.

(5) To check for identification in other parts of the parameter space, change `many_points` in line 8 to 1. Before running dynare again delete folder as2007.

(6) To perform analysis of the version of the model in which the central bank reacts to output growth instead of output gap, change `gap_rule` in line 6 to 0.

Method (2). Without Dynare, using numerical derivatives

put `util` in the Matlab path and run part (1) of `MainIdentification.m`

Method (3). Without Dynare, using analytical derivatives

run part (2) of `MainIdentification.m`

Notes:

(1) In this model and for these parameter values the numeric derivatives are quite accurate (see line 49). That is not always the case, especially for larger models with more complicated functional relationships. In the very least the difference may be between recognizing weak identification instead of concluding that parameters are unidentifiable.

(2) Typically (also in this model) lack of identification is much easier to detect by computing the Jacobian of the solution parameters instead of the moments (which is much larger and therefore slower to compute). See the paper for details; this is implemented in Dynare and reported as rank of matrix H. If the model is identified at all, it is sufficient to confirm full rank of the moments Jacobian for a few lags. For example, the output gap version of this model is identified from the mean, covariance and first autocovariance matrix if one of the Taylor rule parameters or the policy shock variance were known, see lines after line 48 of `MainIdentification.m`. (The same is true for the output growth version without having to fix any parameters). Thus there is no need to compute the Jacobian for higher order autocovariances.

(3) The identification of the output gap specification of the same model is analyzed in "Dynamic Identification of DSGE Models" by Komunjer and Ng, who also detect identification failure. There are several noticeable differences with the present results. First, they associate the lack of identification with linear dependence among the three Taylor rule parameters, which, as can be seen in the output from Dynare, are highly but not perfectly collinear (exact collinearity occurs only when stdr is included). Second, they have to set much larger level of tolerance for Matlab's `rank` in order to correctly detect lack of identification. In particular, they report that at the default level their condition wrongly indicates identifiability. This may be due to the use of numerical derivatives although, on the computer I have tested it, Method 1 gives correct answer at TOL = 1e-8 and larger (the default is larger) and fails at TOL = 1e-9 or smaller. By using analytical derivatives Method 2 gives correct answer at TOL = 1e-13 on a Mac and TOL=1e-15 on a PC.