

This file describes the replication of the model simulations in Berka, Devereux and Engel (2018), “Real Exchange Rates and Sectoral Productivity in the Eurozone”, American Economic Review

Folder name: Model

### Description of files

The folder contains 18 files.

- 1 Excel file
- 1 readme pdf
- 15 Matlab files

**BDE2017\_start.m** produces an output file “**BDE\_program\_output.xls**” which contains 3 sheets with model simulation data for flexible price, sticky price 1, and sticky price 2 scenarios. Each matrix is 29 coefficient estimates by 500 simulations large. Below each 29x500 matrix of data, there are 3 rows which contain, for each coefficient estimate, the median and the 90<sup>th</sup> percentile confidence intervals. The acronyms of the 29 coefficient names are explained below, and map directly to the model regression tables in the article. **BDE2017\_start.m** is the master-program which calls all other programs.

**BDE2017\_simul.m** is the program which executes a full model simulation for a given level of the price stickiness parameter. It reads in data from **BDE\_program\_input.xls**, assigns model parameters except price stickiness (this is where they can be altered), numerically solves the model (**BDE2017\_ss.m**) and runs 500 simulations (**BDE2017\_run.m**) to generate simulated data.

**BDE2017\_ss.m** is a function that numerically solves the steady state of the model (contained in **BDE2017\_basemod.m**)

**BDE\_program\_input.xls** contains inputs into Matlab programs. These come from the data, as reported in “**SummaryStats.xls**” in folder “Tables”.

**BDE2017\_run.m** runs simulations.

Other files contain auxiliary files and various numerical solvers. They need to stay in the same folder for the model simulations to run.

### Program instructions

The program is run simply by running **BDE2017\_start.m**, which calls all of the other programs. The number of simulations is set in the program **BDE2017\_simul.m**, currently set as SIM = 500. The model parameters (except for the price stickiness) are set in the program **BDE2017\_simul.m**, with the current settings given by:

$\alpha$  : alp =1;

$\sigma$  : sig=2;

$\psi$  : ppsi=1;

$\gamma$  : gam=.5;

$\kappa$  : kap=.6;

$\omega$  : omeg=.5;

$\phi$  : phi=0.25;

$\lambda$  : lam=8;

$\theta$  : thet=.7;

$\sigma_p$  : sigP=2;

$\beta$  : bet=.99;

sigER – this is set at a large number (8888) to insure the nominal exchange rate is fixed.

The price stickiness parameter (kkk, which assumes that the sectoral speed of price adjustment is identical (kkt=kkn)) is set in **BDE2017\_start.m**. This parameter sets the speed of adjustment in the linearized Phillips curve. It is currently set to 999 for flexible prices, 0.1 for “Sticky Price 1”, and 0.2 for “Sticky Price 2”.

### **Program inputs**

The programs use the mean levels of traded and nontraded productivity and labor wedge (all expressed as the EU average relative to each country), the persistence of these variables (in a first-order autoregression) and the covariance matrix of these variables as inputs. In particular, with 9 countries and 3 variables, the covariance matrix is 27x27.

The program constructs artificial data for nine countries (all expressed as foreign country relative to home country) that has the same means, persistence and covariance matrix as the data, as explained in the paper.

The program **BDE2017\_simul.m** calls the Excel spreadsheet: **BDE2017\_program\_input.xlsx**. The sample means are called from the tab labelled means, the persistence from the tab labelled persistence, and the covariance from the tab labelled covariance\_new.

Note that the persistence levels are taken as the fourth root of the persistence of the annual variables, which in turn are reported in the tab TFP\_index\_shocks (see file “**SummaryStats.xls**” in folder “Tables”), and analogously for the persistence of the labor wedge, reported in tab labor\_wedgeA. In cases in which the sample autocorrelation is greater than 1.0, it is set to 0.99 in the spreadsheet in the persistence tab.

Appendix F of the paper reports results using an alternative measure of the labor wedge. In this case, the program constructs artificial data using input for from tab labor\_wedgeB.

### **Program output**

The output is saved in file “**BDE\_program\_output.xls**” which contains 3 sheets with model simulation data for the artificial economy. The 3 sheets contain information for flexible price, sticky price 1, and sticky price 2 scenarios. Each sheet contains information on 29 statistics for each of N simulations (currently, N=500) and therefore has a size N x 29. Below each matrix, there are 3 rows which contain, for each coefficient estimate, the median and the 90<sup>th</sup> percentile confidence

intervals. Each row in the Excel file of output reports the results of a different simulation. The 29 columns correspond to the following statistics:

1. bts - Slope coefficient for a regression of the real exchange rate on traded productivity in the time series.
2. bcs - Slope coefficient for a regression of the real exchange rate on traded productivity in the cross section.
3. t9a\_q\_qn – The slope coefficient on the regression of the log of the real exchange rate on the  $q_n$  (the relative price of nontraded to traded goods) in the time series.
4. t9b\_q\_qn – The slope coefficient on the regression of the log of the real exchange rate on the  $q_n$  (the relative price of nontraded to traded goods) in the cross section.
5. t9a\_qT\_qn - The slope coefficient of the regression of  $q_T$  on  $q_n$  in the time series.
6. t9b\_qT\_qn - The slope coefficient of the regression of  $q_T$  on  $q_n$  in the cross section.
7. t9a\_q\_qT - The slope coefficient of the regression of  $q$  on  $q_T$  in the time series.
8. t9a\_q\_qT - The slope coefficient of the regression of  $q$  on  $q_T$  in the cross section.
9. t8\_std\_q\_ts - Time series standard deviation of the log of the real exchange rate.
10. t8\_std\_q\_cs - Cross section standard deviation of the log of the real exchange rate.
11. stdpnttim - Time series standard deviation of  $q_n$ .
12. stdpntcro - Cross section standard deviation of  $q_n$ .
13. t8\_std\_q\_ar - Autocorrelation of the log of the real exchange rate.
14. t12a\_aT - Coefficient on relative (log) traded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity in the time series.
15. t12a\_aN - Coefficient on relative (log) nontraded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity in the time series.
16. t12b\_aT - Coefficient on relative (log) traded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity in the cross-section.
17. t12b\_aN - Coefficient on relative (log) nontraded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity in the cross-section.
18. t10a\_aT - Coefficient on relative (log) traded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) unit labor costs in the time series.
19. t10a\_aN - Coefficient on relative (log) nontraded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) unit labor costs in the time series.
20. t10a\_rulc - Coefficient on relative (log) unit labor costs in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) unit labor costs in the time series.

21. t10b\_aT - Coefficient on relative (log) traded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) unit labor costs in the cross section.
22. t10b\_aN - Coefficient on relative (log) nontraded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) unit labor costs in the cross section.
23. t10b\_rulc - Coefficient on relative (log) unit labor costs in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) unit labor costs in the cross section.
24. t11a\_aT - Coefficient on relative (log) traded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) labor wedge in the time series.
25. t11a\_aN - Coefficient on relative (log) nontraded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) labor wedge in the time series.
26. t11a\_rulc - Coefficient on relative (log) labor wedge in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) labor wedge in the time series.
27. t11b\_aT - Coefficient on relative (log) traded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) labor wedge in the cross section.
28. t11b\_aN - Coefficient on relative (log) nontraded productivity in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) labor wedge in the cross section.
29. t11b\_rulc - Coefficient on relative (log) labor wedge in a regression of  $q$  on relative (log) traded productivity and relative (log) nontraded productivity and relative (log) labor wedge in the cross section.