ASMA: An AR(p) - ASYMMETRIC MA(q) ML ESTIMATION - WALD TEST PROGRAM

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The program is started by the command ASMA. ASMA is written in FORTRAN code and is compiled with LAHEY 386 compiler (Program versions: Nov 1990/ Feb 1991 / Sept 1992 / Nov 1993.) Extended memory is therefore to be handled the same way as for LIMDEP and TSP. The general theory for this model is laid out in Brännäs and De Gooijer (1994), Brännäs, De Gooijer and Teräsvirta (1998) and De Gooijer and Brännäs (1995).

On start-up the program asks for the name of three files:

1 Parameter input file

(required order):

- T the number of time series observations
- p the number of included AR-lags
- q^+ the number of included asMA$^+$ lags
- q^- the number of included asMA$^-$ lags
- AR - lags
- asMA$^+$ lags
- asMA$^-$ lags
- Initial guesses on (AR: asMA$^+$: asMA$^-$)

2 Data input file

Should contain only one time series.

3 Log file

The program asks for the name of a log file, where all estimation results (and where series, fitted values, and residuals) are (may be) saved.

4 Main menu

POSSIBLE ACTIONS

- 1. Estimate and test
- 2. Initial estimation
- 3. Series and residual to file
- 4. Invertibility check
- 5. Transformation of series
- 6. Model specification
- 7. Iteration criteria
- 8. Autocorrelation function
- 10. Forecast $h = 4$ ahead
- 9. Exit

4.1 Example:

DATA FILE INPUT : growth.dat
PARAMETER INPUT FILE : par-growth.dat
RESULT FILE : result-2016.out (see next page)

4.2 Comments

Action 1 represents the main part of the program. Action 6 makes it possible to see the model structure and possibly to formulate another model than specified on input. Action 7 lets you, for instance, automatically call the AMOEBA FORTRAN routine for minimizing $\ln L \propto \sum \widehat{u}_t^2$ any number of times. You should certainly call more than one time. Action 4 provides an empirical invertibility check.

4.3 Bugs, etc.

The author is not aware of any bugs in the program. The program will probably contain an improved initial estimator to speed up iterations next time it is revised.

References:

Brännäs, K. and De Gooijer, J.G. (1994). Autoregressive-asymmetric moving average models for business cycle data. *Journal of Forecasting*, 13(6), 529–544.

Brännäs, K., De Gooijer, J.G., and Teräsvirta, T. (1998). Testing linearity against nonlinear

moving average models. *Communications in Statistics: Theory and Methods*, 27(8), 2025–2035.

De Gooijer, J.G. and Brännäs, K. (1995). Invertibility of non-linear time series models. *Communications in Statistics: Theory and Methods*, 24(11), 2701–2714.

File: result-2016.out

```
ARasMA( 0; 5; 5)-#lags
AR-lags  :
asMA(+:-)lags:   1  2  3 21 22  1  2  3 21 22
 Difference (1=yes)             : 0
 Seasonal (4=1;12=2) difference : 0
 Logarithm (1=yes)              : 0
     LAG     VALUE        SE         t  de=(asMA+)-(asMA- ) tde
asMA+  1   0.69603   0.07288   9.55070
asMA+  2   0.34163   0.08222   4.15491
asMA+  3   0.22380   0.12067   1.85464
asMA+ 21  -0.10032   0.09300  -1.07870
asMA+ 22   1.11960   0.09235  12.12336
asMA-  1   0.60301   0.06689   9.01462   0.09302   0.99957
asMA-  2   0.63014   0.08734   7.21456  -0.28852  -2.16129
asMA-  3  -0.07492   0.13040  -0.57455   0.29872   1.38367
asMA- 21   0.48115   0.12790   3.76174  -0.58146  -3.24000
asMA- 22  -0.34638   0.07641  -4.53338   1.46597  12.48786
Const      0.00675   0.00137   4.92363
   s2(res):           0.0000680
  AIC:                -9.45  SBIC:                -9.23
   R2:                 0.44  ln L:             648.9938
LJUNG-BOX          :     18.85 p-value:0.0265 WITH  9 DF
JARQUE-BERA        :      0.83 p-value:0.6613
WALD LINEARITY TEST:    348.94 p-value:0.0000 WITH  5 DF
   152             0.02497
   153             0.01287
   154             0.00005
   155             0.01431
```