Modeleasy+ 5.4 Enhancements

A new command to perform Vector Autoregression analysis has been introduced in release 5.4 of Modeleasy+. This command is named VAR and its description and use are discussed below along with an example.

The syntax of the VAR command is:

```
VAR ( endog_names : [ C ] [ exog_names ] : NLAGS=nlg [ options ] )
```

where "endog_names" is a list of the names of endogenous variables, "C" is an optional keyword for specifying the presence of a constant term, "exog_names" is an optional list of the names of the exogenous variables, NLAGS=nlgs specifies the number of lags, "nlgs", and "options" are optional fields which are discussed further below. A simple example of the use of the VAR command is shown in below. Note that only the simplest form of the syntax is used and defaults are taken for the computation of the estimation (OLS) and the shocks used to compute the impulse response function (Choleski factor of residual covariance matrix). With no time horizon specified, a 12 period horizon is assumed.

```
:_x = integers(30); y = 2*x + 5 + random(x)/100
:_x = tseries(x:1980,1,4)
:_y = tseries(y:1980,1,4)
:_var ( y : c, x : nlags=3 )
```

The output from this example is shown below.

```
NENDOG 1
Endog. common TSRANGE: 1980 1 1987 2 4
Exog. common TSRANGE: 1980 1 1987 2 4
VAR-suitable TSRANGE: 1980 4 1987 2 4
User defined TSRANGE: 0 0 0 0
Actually used TSRANGE: 1980 4 1987 2

Coefficients are being estimated using INV(X'X)*X'*Y.

VECTOR AUTOREGRESSION ANALYSIS.

Impulse Response evaluated shocking by
Choleski factor of residual covariance matrix.
```

```
Impulse Response Functions for shock in equation 1 ( Y ).

Period         Y
0                .0028399
1             -2.3125E-4
2             -5.5185E-4
3             -1.7847E-4
4              1.4741E-4
5              7.6304E-5
6             -1.8875E-5
7             -2.7805E-5
8             -1.194E-6
9              7.4784E-6
10             2.2733E-6
11            -1.5745E-6
12            -1.0393E-6


Forecast Error Variance Decomposition for equation 1 ( Y ).

Period        Variance     Y
0              .0028399    1
1              .0028493    1
2              .0029022    1
3              .0029077    1
4              .0029114    1
5              .0029124    1
6              .0029125    1
7              .0029126    1
8              .0029126    1
9              .0029126    1
10             .0029126    1
11             .0029126    1
12             .0029126    1
```

Taking the defaults, as in this example, the estimated coefficients are saved in the object named `VAR_COEF` which is shown below.

```
:_var_coef
VAR_COEF (A 5 by 1 Matrix)
2.6019 -.08143 -.20095 -.095031 2.7549
```

Similarly, objects named `V_IRF_nnn`, where `nnn` ranges from 1 to the number of endogenous variables, are the matrices which contain the impulse response functions due to shocks on the `nnn-th` endogenous variable. Also `FEVDE_nnn` are the matrices containing the forecast error variance decomposition.

The computation and outcome may be controlled by the user by setting the various options described below.

The algorithm for estimating the coefficients may be chosen by the user. For example, the use of the `SIMPLE` keyword (default) in the options field means that the coefficients will be estimated by the standard `OLS` algorithm. Using the keyword `ESTIMATE` means that the coefficients will be estimated using the Modeleasy+ estimate command which allows the user to exploit the output and testing options for this command (`OUTPUTOPTION` and `TESTOPTION`). The use of the `QRESTIMATE` keyword means that the coefficients will be determined by using a complete `QR` orthogonal decomposition algorithm using the `LAPACK` subroutine `DGELSY`.

The VAR analysis may be controlled by the use of optional keywords. The number of periods in which the impulse response function and forecast error variance decomposition are computed is controlled by specifying `HORIZON nprds`, where "`nprds`" is the number of periods in the computation (default 12). The shock values used in these computations may be specified by the use of the keyword `SHOCK` followed by either the name of a user-specified matrix of shocks or either of the `UNITARY` or `CHOLEKSI` (default) keywords. Use of the `UNITARY` keyword specifies that an identity matrix will be used for the shocks, while the use of the `CHOLESKI` keyword specifies that the Choleksi lower triangular factors of the residuals covariance matrix will be used for the shocks. Another keyword of interest is `SMALLSAMPLE` which causes the small sample correction to be used when evaluating the residuals covariance matrix, i.e., the formula `U'*U/(nobs-ncoeffs)` is used instead of `U'*U/nobs`.

Other keywords may also be used to define the names of the objects to contain the results. For example, the `DEFINECOEFF` keyword may be used to specify the name of the object where the estimation results are to be saved instead of the default `VAR_COEF`.

The final example, shown below, is taken from the Lutkepohl data found in Introduction to Multiple Time Series Analysis (1993), Appendix E, Table E.1 on page 498. Using this data, the `VAR` command, where LL is a name list of the endogenous variables Y1, Y2, Y3,

```
:_VAR( LL : C : NLAGS 2 HORIZON 10 SMALLSAMPLE QRESTIMATE )
```

produces the results shown in the tables below.

```
NENDOG 3
Endog. common TSRANGE: 1960 2 1982 4 4
VAR-suitable  TSRANGE: 1960 4 1982 4 4
User defined  TSRANGE: 1960 4 1978 4
Actually used TSRANGE: 1960 4 1978 4

Coefficients are being estimated via a QR decomposition.

VECTOR AUTOREGRESSION ANALYSIS.

Impulse Response evaluated shocking by
Choleski factor of residual covariance matrix.


Impulse Response Functions for shock in equation 1 ( Y1 ).

Period        Y1           Y2           Y3
0              .046148     0            0
1             -.011957      .0064386     .0073031
2            -9.9001E-4     .0050907     .0031572
3              .0049515     .0020859    -.0030991
4              .0013871     .0014988     .0019848
5            -8.3377E-4   -4.4091E-4    5.0696E-4
6             5.4523E-4     .0011203   -3.6678E-4
7             2.716E-4     1.0384E-4    2.8517E-4
8             3.7847E-5   -3.3135E-5    1.3088E-5
9             2.2197E-5    1.818E-4     1.707E-5
10            2.9569E-5    8.1575E-6    3.262E-5
```

Forecast Error Variance Decomposition for equation 1 (Y1).

Period	Variance	Y1	Y2	Y3
0	.046148	1	0	0
1	.048656	.95996	.017511	.022529
2	.049033	.94565	.028021	.02633
3	.049424	.94079	.029361	.029847
4	.049506	.93846	.030181	.031356
5	.049517	.93831	.030246	.031446
6	.049534	.93778	.030737	.031479
7	.049536	.93775	.030739	.03151
8	.049536	.93775	.030739	.03151
9	.049537	.93774	.030752	.03151
10	.049537	.93774	.030752	.03151

Impulse Response Functions for shock in equation 2 (Y2).

Period	Y1	Y2	Y3
0	.0015519	.011616	0
1	.0025608	-3.5062E-4	.002192
2	.0012599	8.8632E-4	-6.7009E-4
3	2.2645E-5	.0014211	9.0997E-4
4	1.7908E-4	-8.9738E-5	6.0847E-5
5	3.7561E-4	4.7919E-4	-1.0132E-4
6	1.1483E-5	6.6058E-5	2.0957E-4
7	3.1648E-5	2.899E-5	-2.6219E-5
8	5.0929E-5	1.0179E-4	8.7812E-6
9	1.0074E-5	-5.199E-6	2.6969E-5
10	1.0293E-5	1.6408E-5	-6.2822E-6

Forecast Error Variance Decomposition for equation 2 (Y2).

Period	Variance	Y1	Y2	Y3
0	.011719	.017536	.98246	0
1	.012199	.060245	.90747	.032285
2	.012314	.069592	.89576	.034645
3	.01243	.068313	.89232	.039366
4	.012431	.068501	.89212	.039379
5	.012447	.069243	.89141	.039348
6	.012449	.069222	.89116	.03962
7	.012449	.069228	.89115	.039623
8	.012449	.069239	.89114	.03962
9	.012449	.069239	.89114	.039625
10	.012449	.069239	.89114	.039625

Impulse Response Functions for shock in equation 3 (Y3).

Period	Y1	Y2	Y3
0	.0026706	.0049341	.0075978
1	-4.6785E-4	.001309	-.0020056
2	.0027831	.003573	8.3559E-4
3	6.5153E-5	-6.9163E-4	6.9111E-4
4	3.2766E-4	9.0461E-4	-1.1978E-4
5	1.2476E-4	3.2783E-4	2.4309E-4
6	1.568E-4	2.108E-5	3.3308E-6
7	6.2159E-5	1.5442E-4	2.2936E-5
8	9.1114E-6	2.6439E-5	4.9238E-5
9	2.8005E-5	2.6358E-5	-1.1208E-5
10	1.3974E-5	2.5848E-5	1.1446E-5

Forecast Error Variance Decomposition for equation 3 (Y3).

Period	Variance	Y1	Y2	Y3
0	.0094448	.07995	.27292	.64713
1	.0097549	.077248	.27385	.6489
2	.010787	.12973	.33364	.53663
3	.010832	.1287	.33499	.53631
4	.010875	.12859	.33924	.53217
5	.010884	.12852	.33963	.53185
6	.010885	.1287	.33956	.53174
7	.010886	.1287	.33968	.53161
8	.010886	.1287	.33968	.53162
9	.010886	.12871	.33968	.53161
10	.010886	.12871	.33968	.53161