
```
      name:  <unnamed>
       log:  C:\Users\jamel\Dropbox\latex\PROJECTS\23-05-geopolitical-risk-pol-tension-oil-price\Data and command\lp
  log type:  smcl
 opened on:  20 Aug 2023, 18:10:53

1 .
2 . import excel .\data_svar.xlsx,/*
  > */ sheet("data") firstrow clear
  (9 vars, 759 obs)

3 .
4 . generate Period = tm(1960m1) + _n-1

5 . format %tm Period

6 .
7 . drop if Period > tm(2019m12)
  (39 observations deleted)

8 .
9 . label variable pri "Political Relationship Index"

10 . label variable pri_s "PRI Standardized"

11 . label variable gop "Global Oil Production"

12 . label variable rspri "Real Spot Price"

13 . label variable wip "World Industrial Production"

14 . label variable dinv "Variation of Inventories"

15 . label variable gprcn ///
   >           "Percent of Articles on China in the Bil. GPR"

16 . label variable igrea ///
   >           "Index of Global Real Economic Activity"

17 .
18 . rename gop pro

19 . rename wip dem

20 . rename rspri rpo

21 .
22 . capture generate lpro = log(pro)

23 . la var lpro "Natural log of PRO"

24 . capture generate lrpo = log(rpo)

25 . la var lpro "Natural log of RPO"

26 . capture generate ldem = log(dem)

27 . la var ldem "Natural log of DEM"

28 .
29 . drop t
```

```
30 . order Period, first

31 .
32 . /* Another transformation for the PRI index */
33 . gen lpri = sign(pri) * log(1 + abs(pri))

34 .
35 . label variable lpri "Political Relationship Index"

36 .
37 . gen ligrea = sign(igrea) * log(1 + abs(igrea))
   (96 missing values generated)

38 .
39 . summarize lpri lpro ldem lrpo gprcn ligrea if Period>tm(2000m1)
```

Variable	Obs	Mean	Std. dev.	Min	Max
lpri	**239**	**.2934882**	**.8635308**	**-2.054124**	**1.193923**
lpro	**239**	**4.318169**	**.0624468**	**4.192786**	**4.438475**
ldem	**239**	**4.702075**	**.1403389**	**4.450089**	**4.904061**
lrpo	**239**	**3.268457**	**.3928032**	**2.388421**	**4.120459**
gprcn	**239**	**.4806391**	**.2381402**	**.1612948**	**1.521136**
ligrea	**239**	**.0950085**	**3.844319**	**-5.093765**	**5.246595**

```
40 . /*
   > outreg2   using sum.doc if Period>tm(2000m1), replace sum(log) ///
   >           keep(lpri lpro ldem lrpo gprcn) dec(3)
   > */
41 .
42 . **#  Declare time series
43 .
44 . tsset Period, monthly

   Time variable: Period, 1960m1 to 2019m12
           Delta: 1 month

45 .
46 . save database_pri_gpr.dta, replace
   file database_pri_gpr.dta saved

47 .
48 . twoway (tsline lpri if Period>tm(2000m1)) ///
   >        (tsline gprcn if Period>tm(2000m1), yaxis(2)), ///
   >            name(G0, replace) legend(off)

49 .
50 . graph export "G0.svg", as(svg) replace
   file G0.svg saved as SVG format

51 . graph export "G0.pdf", as(pdf) replace
   file G0.pdf saved as PDF format

52 . graph export "G0.png", as(png) width(4000) replace
   file G0.png saved as PNG format

53 .
54 . matrix A = (1,0,0,0\.,1,0,0\.,.,1,0\.,.,.,1)

55 . matlist A
```

	c1	c2	c3	c4
r1	**1**	**0**	**0**	**0**
r2	**.**	**1**	**0**	**0**
r3	**.**	**.**	**1**	**0**
r4	**.**	**.**	**.**	**1**

```
56 .
57 . matrix B = (.,0,0,0\0,.,0,0\0,0,.,0\0,0,0,.)

58 . matlist B

             |        c1         c2         c3         c4
-------------+------------------------------------------------
          r1 |         .
          r2 |         0          .
          r3 |         0          0          .
          r4 |         0          0          0          .

59 .
60 . svar lpri lpro ldem lrpo if Period>tm(2000m1), aeq(A) beq(B) ///
   > lags(1/24)
   Estimating short-run parameters

   Iteration 0:  Log likelihood = -1089.3698
   Iteration 1:  Log likelihood =  988.23688
   Iteration 2:  Log likelihood =  1255.9806
   Iteration 3:  Log likelihood =  1738.8122
   Iteration 4:  Log likelihood =  2153.2785
   Iteration 5:  Log likelihood =  2359.5949
   Iteration 6:  Log likelihood =  2436.0247
   Iteration 7:  Log likelihood =  2462.6683
   Iteration 8:  Log likelihood =  2464.6814
   Iteration 9:  Log likelihood =   2464.694
   Iteration 10: Log likelihood =   2464.694

   Structural vector autoregression

    ( 1)  [/A]1_1 = 1
    ( 2)  [/A]1_2 = 0
    ( 3)  [/A]1_3 = 0
    ( 4)  [/A]1_4 = 0
    ( 5)  [/A]2_2 = 1
    ( 6)  [/A]2_3 = 0
    ( 7)  [/A]2_4 = 0
    ( 8)  [/A]3_3 = 1
    ( 9)  [/A]3_4 = 0
    (10)  [/A]4_4 = 1
    (11)  [/B]1_2 = 0
    (12)  [/B]1_3 = 0
    (13)  [/B]1_4 = 0
    (14)  [/B]2_1 = 0
    (15)  [/B]2_3 = 0
    (16)  [/B]2_4 = 0
    (17)  [/B]3_1 = 0
    (18)  [/B]3_2 = 0
    (19)  [/B]3_4 = 0
    (20)  [/B]4_1 = 0
    (21)  [/B]4_2 = 0
    (22)  [/B]4_3 = 0

   Sample: 2000m2 thru 2019m12                     Number of obs     =        239
   Exactly identified model                        Log likelihood    =   2464.694

   ------------------------------------------------------------------------------
                |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
   -------------+----------------------------------------------------------------
   /A           |
           1_1  |          1  (constrained)
           2_1  |  -.0126754   .0047564    -2.66   0.008    -.0219977   -.0033531
           3_1  |   .0007724   .0031607     0.24   0.807    -.0054225    .0069673
           4_1  |   .0836298   .0493863     1.69   0.090    -.0131656    .1804253
           1_2  |          0  (constrained)
           2_2  |          1  (constrained)
           3_2  |  -.0649535   .0423596    -1.53   0.125    -.1479769    .0180698
           4_2  |   1.620257   .6650372     2.44   0.015     .3168079    2.923706
           1_3  |          0  (constrained)
           2_3  |          0  (constrained)
           3_3  |          1  (constrained)
           4_3  |   -2.33248   1.010576    -2.31   0.021    -4.313173   -.3517882
```

1_4	0	(constrained)				
2_4	0	(constrained)				
3_4	0	(constrained)				
4_4	1	(constrained)				
/B						
1_1	.0808577	.0036983	21.86	0.000	.0736091	.0881063
2_1	0	(constrained)				
3_1	0	(constrained)				
4_1	0	(constrained)				
1_2	0	(constrained)				
2_2	.0059456	.0002719	21.86	0.000	.0054126	.0064786
3_2	0	(constrained)				
4_2	0	(constrained)				
1_3	0	(constrained)				
2_3	0	(constrained)				
3_3	.0038936	.0001781	21.86	0.000	.0035445	.0042426
4_3	0	(constrained)				
1_4	0	(constrained)				
2_4	0	(constrained)				
3_4	0	(constrained)				
4_4	.0608295	.0027823	21.86	0.000	.0553764	.0662827

```
61 .
62 . /* compute the inv(B)*A matrix */
63 . matrix A=e(A)

64 . matrix B=e(B)

65 . matrix BA = inv(B)*A

66 . /* compute reduced form epsilon_t residuals */
67 . var lpri lpro ldem lrpo if Period>tm(2000m1)

   Vector autoregression

   Sample: 2000m2 thru 2019m12                     Number of obs     =       239
   Log likelihood =   2190.165                     AIC               =  -18.02649
   FPE            =   1.74e-13                     HQIC              =  -17.81547
   Det(Sigma_ml)  =   1.29e-13                     SBIC              =  -17.50284

   Equation           Parms      RMSE     R-sq      chi2     P>chi2
   ------------------------------------------------------------------
   lpri                   9     .113468   0.9833   14084.61   0.0000
   lpro                   9     .007845   0.9847    15430.2   0.0000
   ldem                   9     .005659   0.9984   151862.9   0.0000
   lrpo                   9     .080528   0.9594   5645.453   0.0000
   ------------------------------------------------------------------
```

	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
lpri						
lpri						
L1.	1.02088	.065043	15.70	0.000	.8933984	1.148362
L2.	-.0404373	.0649793	-0.62	0.534	-.1677943	.0869197
lpro						
L1.	-.5662178	.9375872	-0.60	0.546	-2.403855	1.271419
L2.	.4591511	.9410169	0.49	0.626	-1.385208	2.30351
ldem						
L1.	2.328491	1.235075	1.89	0.059	-.0922117	4.749194
L2.	-2.516937	1.222366	-2.06	0.039	-4.91273	-.1211443
lrpo						
L1.	.0197547	.0909455	0.22	0.828	-.1584951	.1980046
L2.	.0561329	.0913182	0.61	0.539	-.1228475	.2351133
_cons	1.092742	1.088601	1.00	0.315	-1.040876	3.22636
lpro						

lpri						
L1.	.0046979	.0044971	1.04	0.296	-.0041163	.0135122
L2.	-.0051903	.0044927	-1.16	0.248	-.0139959	.0036153
lpro						
L1.	.8960902	.0648256	13.82	0.000	.7690342	1.023146
L2.	.0002203	.0650628	0.00	0.997	-.1273004	.127741
ldem						
L1.	.1852567	.0853942	2.17	0.030	.0178871	.3526264
L2.	-.1393035	.0845155	-1.65	0.099	-.3049508	.0263439
lrpo						
L1.	.0084163	.0062881	1.34	0.181	-.003908	.0207407
L2.	-.0104668	.0063138	-1.66	0.097	-.0228417	.001908
_cons	.2392245	.0752669	3.18	0.001	.0917042	.3867448
ldem						
lpri						
L1.	.004107	.0032438	1.27	0.205	-.0022508	.0104649
L2.	-.0032437	.0032407	-1.00	0.317	-.0095953	.0031079
lpro						
L1.	.0922844	.0467596	1.97	0.048	.0006372	.1839315
L2.	-.0690136	.0469307	-1.47	0.141	-.160996	.0229688
ldem						
L1.	1.151338	.061596	18.69	0.000	1.030612	1.272064
L2.	-.1602631	.0609622	-2.63	0.009	-.2797468	-.0407795
lrpo						
L1.	.0238001	.0045357	5.25	0.000	.0149103	.0326898
L2.	-.0253468	.0045542	-5.57	0.000	-.0342729	-.0164206
_cons	-.0522002	.054291	-0.96	0.336	-.1586086	.0542082
lrpo						
lpri						
L1.	-.0363973	.0461606	-0.79	0.430	-.1268704	.0540758
L2.	.0459971	.0461153	1.00	0.319	-.0443872	.1363815
lpro						
L1.	-.476452	.6653989	-0.72	0.474	-1.78061	.8277059
L2.	-.0750901	.6678329	-0.11	0.910	-1.384019	1.233838
ldem						
L1.	2.394223	.876524	2.73	0.006	.6762673	4.112178
L2.	-2.102661	.8675043	-2.42	0.015	-3.802938	-.4023834
lrpo						
L1.	1.170197	.0645433	18.13	0.000	1.043694	1.2967
L2.	-.232986	.0648079	-3.60	0.000	-.3600071	-.1059649
_cons	1.209696	.772572	1.57	0.117	-.3045171	2.72391

```
68 . capture drop epsilon*

69 . predict double epsilon1 if Period>tm(2000m1),residual eq(#1)
   (481 missing values generated)
```

```
70 . predict double epsilon2 if Period>tm(2000m1),residual eq(#2)
   (481 missing values generated)

71 . predict double epsilon3 if Period>tm(2000m1),residual eq(#3)
   (481 missing values generated)

72 . predict double epsilon4 if Period>tm(2000m1),residual eq(#4)
   (481 missing values generated)

73 . /* store the epsilon* variables in the epsilon matrix */
74 . mkmat epsilon*, matrix(epsilon)

75 . /* compute e_t matrix of structural shocks */
76 . matrix e = (BA*epsilon')'

77 . /* store columns of e as variables e1, e2, and e3 */
78 . svmat double e

79 .
80 . label variable epsilon1 "Reduced-form shocks - PRI"

81 . label variable e1 "Structural shocks - PRI"

82 .
83 . twoway (tsline e1 if Period>tm(2000m1)) (tsline epsilon1 ///
   > if Period>tm(2000m1), yaxis(1)), ///
   >  name(G1, replace) legend(position(6)) graphregion(margin(r+5))

84 .
85 . graph export "G1.svg", as(svg) replace
   file G1.svg saved as SVG format

86 . graph export "G1.png", as(png) width(4000) replace
   file G1.png saved as PNG format

87 . graph export "G1.pdf", as(pdf) replace
   file G1.pdf saved as PDF format

88 .
89 . irf set comparemodels.irf, replace
   (file comparemodels.irf created)
   (file comparemodels.irf now active)

90 . quietly lpirf lpro ldem lrpo, step(48) lags(1/24) ///
   >   exog(L(0/24).e1) vce(robust)

91 . irf create lpmodel
   (file comparemodels.irf updated)

92 .
93 . quietly var lpro ldem lrpo, lags(1/24)            ///
   >   exog(L(0/24).e1)

94 . irf create varmodel, step(48)
   (file comparemodels.irf updated)

95 .
96 . irf graph dm, impulse(e1) response(lrpo)   ///
   >   irf(lpmodel varmodel) level(95) name(G2, replace) ///
   >     xline(0 10 20 30 40 50, lcolor(blue)) yline(-.05 0 .05 .1, lcolor(blue))
```

```
 97 .
 98 . graph export "G2.svg", replace
    file G2.svg saved as SVG format

 99 . graph export "G2.png", as(png) width(4000) replace
    file G2.png saved as PNG format

100 . graph export "G2.pdf", as(pdf) replace
    file G2.pdf saved as PDF format

101 .
102 . /* GPR */
103 .
104 . matrix A = (1,0,0,0\.,1,0,0\.,.,1,0\.,.,.,1)

105 . matlist A

             |        c1         c2         c3         c4
-------------+--------------------------------------------
          r1 |         1          0          0          0
          r2 |         .          1          0          0
          r3 |         .          .          1          0
          r4 |         .          .          .          1

106 .
107 . matrix B = (.,0,0,0\0,.,0,0\0,0,.,0\0,0,0,.)

108 . matlist B

             |        c1         c2         c3         c4
-------------+--------------------------------------------
          r1 |         .
          r2 |         0          .
          r3 |         0          0          .
          r4 |         0          0          0          .

109 .
110 . svar gprcn lpro ldem lrpo if Period>tm(2000m1), aeq(A) beq(B) ///
    > lags(1/24)
    Estimating short-run parameters

    Iteration 0:  Log likelihood = -1093.1299
    Iteration 1:  Log likelihood =  366.84133
    Iteration 2:  Log likelihood =  925.91491
    Iteration 3:  Log likelihood =  1190.8535
    Iteration 4:  Log likelihood =  1559.6293
    Iteration 5:  Log likelihood =  1872.7545
    Iteration 6:  Log likelihood =  2176.4317
    Iteration 7:  Log likelihood =   2281.754
    Iteration 8:  Log likelihood =  2324.3724
    Iteration 9:  Log likelihood =  2325.2756
    Iteration 10: Log likelihood =  2325.2767
    Iteration 11: Log likelihood =  2325.2767

    Structural vector autoregression

     ( 1)  [/A]1_1 = 1
     ( 2)  [/A]1_2 = 0
     ( 3)  [/A]1_3 = 0
     ( 4)  [/A]1_4 = 0
     ( 5)  [/A]2_2 = 1
     ( 6)  [/A]2_3 = 0
     ( 7)  [/A]2_4 = 0
     ( 8)  [/A]3_3 = 1
     ( 9)  [/A]3_4 = 0
     (10)  [/A]4_4 = 1
     (11)  [/B]1_2 = 0
     (12)  [/B]1_3 = 0
     (13)  [/B]1_4 = 0
     (14)  [/B]2_1 = 0
     (15)  [/B]2_3 = 0
     (16)  [/B]2_4 = 0
     (17)  [/B]3_1 = 0
```

```
 (18)  [/B]3_2 = 0
 (19)  [/B]3_4 = 0
 (20)  [/B]4_1 = 0
 (21)  [/B]4_2 = 0
 (22)  [/B]4_3 = 0

Sample: 2000m2 thru 2019m12                     Number of obs     =       239
Exactly identified model                        Log likelihood    =  2325.277
```

	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
/A						
1_1	1	(constrained)				
2_1	-.0049828	.0029376	-1.70	0.090	-.0107404	.0007749
3_1	.0020722	.0019717	1.05	0.293	-.0017923	.0059367
4_1	-.012775	.0303738	-0.42	0.674	-.0723066	.0467566
1_2	0	(constrained)				
2_2	1	(constrained)				
3_2	-.101516	.0431567	-2.35	0.019	-.1861016	-.0169304
4_2	1.783492	.6709258	2.66	0.008	.4685019	3.098483
1_3	0	(constrained)				
2_3	0	(constrained)				
3_3	1	(constrained)				
4_3	-2.378802	.9941626	-2.39	0.017	-4.327325	-.4302789
1_4	0	(constrained)				
2_4	0	(constrained)				
3_4	0	(constrained)				
4_4	1	(constrained)				
/B						
1_1	.1335812	.0061099	21.86	0.000	.1216061	.1455563
2_1	0	(constrained)				
3_1	0	(constrained)				
4_1	0	(constrained)				
1_2	0	(constrained)				
2_2	.0060665	.0002775	21.86	0.000	.0055227	.0066104
3_2	0	(constrained)				
4_2	0	(constrained)				
1_3	0	(constrained)				
2_3	0	(constrained)				
3_3	.0040475	.0001851	21.86	0.000	.0036847	.0044104
4_3	0	(constrained)				
1_4	0	(constrained)				
2_4	0	(constrained)				
3_4	0	(constrained)				
4_4	.0622077	.0028453	21.86	0.000	.056631	.0677844

```
111 .
112 . /* compute the inv(B)*A matrix */
113 . matrix A=e(A)

114 . matrix B=e(B)

115 . matrix BA = inv(B)*A

116 . /* compute reduced form epsilon_t residuals */
117 . var gprcn lpro ldem lrpo if Period>tm(2000m1)

    Vector autoregression

    Sample: 2000m2 thru 2019m12                 Number of obs     =       239
    Log likelihood =   2090.976                 AIC               = -17.19645
    FPE            =   4.00e-13                 HQIC              = -16.98544
    Det(Sigma_ml)  =   2.96e-13                 SBIC              =  -16.6728
```

Equation	Parms	RMSE	R-sq	chi2	P>chi2
gprcn	9	.16742	0.5224	261.3788	0.0000
lpro	9	.007868	0.9847	15341.54	0.0000
ldem	9	.005694	0.9984	149979.7	0.0000
lrpo	9	.080839	0.9591	5600.213	0.0000

	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
gprcn						
gprcn						
L1.	.4500914	.0620854	7.25	0.000	.3284062	.5717767
L2.	.1775588	.0620725	2.86	0.004	.0558989	.2992186
lpro						
L1.	-3.200558	1.372682	-2.33	0.020	-5.890966	-.5101505
L2.	3.960201	1.376321	2.88	0.004	1.262662	6.65774
ldem						
L1.	1.927062	1.823162	1.06	0.291	-1.646271	5.500395
L2.	-1.9184	1.801013	-1.07	0.287	-5.448321	1.611521
lrpo						
L1.	.1292757	.1330733	0.97	0.331	-.1315432	.3900947
L2.	-.1787356	.1316673	-1.36	0.175	-.4367988	.0793277
_cons	-2.978551	1.618397	-1.84	0.066	-6.15055	.1934488
lpro						
gprcn						
L1.	-.001069	.0029176	-0.37	0.714	-.0067874	.0046494
L2.	.0015092	.002917	0.52	0.605	-.004208	.0072264
lpro						
L1.	.9096059	.0645068	14.10	0.000	.7831748	1.036037
L2.	-.0128948	.0646778	-0.20	0.842	-.139661	.1138714
ldem						
L1.	.1828189	.0856764	2.13	0.033	.0148963	.3507415
L2.	-.1369852	.0846355	-1.62	0.106	-.3028678	.0288973
lrpo						
L1.	.007536	.0062536	1.21	0.228	-.0047207	.0197927
L2.	-.0099852	.0061875	-1.61	0.107	-.0221124	.002142
_cons	.2389479	.0760538	3.14	0.002	.0898853	.3880106
ldem						
gprcn						
L1.	.0017658	.0021117	0.84	0.403	-.002373	.0059045
L2.	-.000872	.0021112	-0.41	0.680	-.0050099	.0032659
lpro						
L1.	.0935613	.0466877	2.00	0.045	.002055	.1850676
L2.	-.0741439	.0468115	-1.58	0.113	-.1658927	.017605
ldem						
L1.	1.16219	.0620095	18.74	0.000	1.040653	1.283726
L2.	-.1734031	.0612562	-2.83	0.005	-.293463	-.0533433
lrpo						
L1.	.0231581	.0045261	5.12	0.000	.0142871	.0320291
L2.	-.0232409	.0044783	-5.19	0.000	-.0320182	-.0144637
_cons	-.0298126	.055045	-0.54	0.588	-.1376988	.0780736
lrpo						
gprcn						
L1.	.0054426	.0299781	0.18	0.856	-.0533135	.0641986
L2.	-.0190787	.0299719	-0.64	0.524	-.0778225	.0396651

lpro						
L1.	-.6051497	.6628032	-0.91	0.361	-1.90422	.6939207
L2.	.0453315	.6645601	0.07	0.946	-1.257182	1.347845
ldem						
L1.	2.463921	.8803188	2.80	0.005	.7385276	4.189314
L2.	-2.17557	.869624	-2.50	0.012	-3.880002	-.4711387
lrpo						
L1.	1.177965	.0642548	18.33	0.000	1.052028	1.303902
L2.	-.2313584	.0635759	-3.64	0.000	-.3559649	-.1067519
_cons	1.239634	.7814471	1.59	0.113	-.291974	2.771243

```
118 . capture drop epsilon_*

119 . predict double epsilon_1 if Period>tm(2000m1),residual eq(#1)
    (481 missing values generated)

120 . predict double epsilon_2 if Period>tm(2000m1),residual eq(#2)
    (481 missing values generated)

121 . predict double epsilon_3 if Period>tm(2000m1),residual eq(#3)
    (481 missing values generated)

122 . predict double epsilon_4 if Period>tm(2000m1),residual eq(#4)
    (481 missing values generated)

123 . /* store the epsilon* variables in the epsilon matrix */
124 . mkmat epsilon_*, matrix(epsilon_)

125 . /* compute e_t matrix of structural shocks */
126 . matrix e_ = (BA*epsilon_')'

127 . /* store columns of e as variables e1, e2, and e3 */
128 . svmat double e_

129 .
130 . label variable epsilon_1 "Reduced-form shocks - GPR"

131 . label variable e_1 "Structural shocks - GPR"

132 .
133 . twoway (tsline e_1 if Period>tm(2000m1)) (tsline epsilon_1 ///
    > if Period>tm(2000m1), yaxis(1)), ///
    >  name(G3, replace) legend(position(6)) graphregion(margin(r+5))

134 .
135 . graph export "G3.svg", as(svg) replace
    file G3.svg saved as SVG format

136 . graph export "G3.png", as(png) width(4000) replace
    file G3.png saved as PNG format

137 . graph export "G3.pdf", as(pdf) replace
    file G3.pdf saved as PDF format

138 .
139 . irf set comparemodels1.irf, replace
    (file comparemodels1.irf created)
    (file comparemodels1.irf now active)
```

```
140 . quietly lpirf lpro ldem lrpo, step(48) lags(1/24) ///
    >   exog(L(0/24).e_1) vce(robust)

141 . irf create lpmodel1
    (file comparemodels1.irf updated)

142 .
143 . quietly var lpro ldem lrpo, lags(1/24)            ///
    >   exog(L(0/24).e_1)

144 . irf create varmodel1, step(48)
    (file comparemodels1.irf updated)

145 .
146 . irf graph dm, impulse(e_1) response(lrpo)   ///
    >   irf(lpmodel1 varmodel1) level(95) name(G4, replace) ///
    >     xline(0 10 20 30 40 50, lcolor(blue)) yline(-.05 0 .05 .1, lcolor(blue))

147 .
148 . graph export "G4.svg", replace
    file G4.svg saved as SVG format

149 . graph export "G4.png", as(png) width(4000) replace
    file G4.png saved as PNG format

150 . graph export "G4.pdf", as(pdf) replace
    file G4.pdf saved as PDF format

151 .
152 . twoway (tsline e1 if Period>tm(2000m1)) (tsline e_1 ///
    > if Period>tm(2000m1), yaxis(1)), ///
    >  name(G5, replace) legend(position(6)) graphregion(margin(r+5))

153 .
154 . graph export "G5.svg", replace
    file G5.svg saved as SVG format

155 . graph export "G5.png", as(png) width(4000) replace
    file G5.png saved as PNG format

156 . graph export "G5.pdf", as(pdf) replace
    file G5.pdf saved as PDF format

157 .
158 . pwcorr lrpo e1 e_1, obs sig listwise star(5) sidak
```

	lrpo	e1	e_1
lrpo	**1.0000**		
	239		
e1	**-0.0304**	**1.0000**	
	0.9536		
	239	**239**	
e_1	**-0.0073**	**0.0693**	**1.0000**
	0.9993	**0.6364**	
	239	**239**	**239**

```
159 .
160 . twoway (scatter lrpo e1) (lfit lrpo e1), name(G6, replace)

161 . graph export "G6.svg", replace
    file G6.svg saved as SVG format

162 . graph export "G6.png", as(png) width(4000) replace
    file G6.png saved as PNG format

163 . graph export "G6.pdf", as(pdf) replace
    file G6.pdf saved as PDF format

164 .
165 . twoway (scatter lrpo e_1) (lfit lrpo e_1), name(G7, replace)

166 . graph export "G7.svg", replace
    file G7.svg saved as SVG format

167 . graph export "G7.png", as(png) width(4000) replace
    file G7.png saved as PNG format

168 . graph export "G7.pdf", as(pdf) replace
    file G7.pdf saved as PDF format

169 .
170 . save lpirf_PRI_GPR, replace
    file lpirf_PRI_GPR.dta saved

171 .
172 . ****************************************************************
173 . **# Robustness with IGREA ************************************
174 . ****************************************************************
175 .
176 . matrix A = (1,0,0,0\.,1,0,0\.,.,1,0\.,.,.,1)

177 . matlist A

             |        c1         c2         c3         c4
-------------+--------------------------------------------
          r1 |         1          0          0          0
          r2 |         .          1          0          0
          r3 |         .          .          1          0
          r4 |         .          .          .          1

178 .
179 . matrix B = (.,0,0,0\0,.,0,0\0,0,.,0\0,0,0,.)

180 . matlist B

             |        c1         c2         c3         c4
-------------+--------------------------------------------
          r1 |         .
          r2 |         0          .
          r3 |         0          0          .
          r4 |         0          0          0          .

181 .
182 . svar lpri lpro ligrea lrpo if Period>tm(2000m1), aeq(A) beq(B) ///
    > lags(1/24)
    Estimating short-run parameters

    Iteration 0:  Log likelihood = -1291.7798
    Iteration 1:  Log likelihood = -161.03225
    Iteration 2:  Log likelihood =  92.968259
    Iteration 3:  Log likelihood =  659.74678
    Iteration 4:  Log likelihood =  724.00374
    Iteration 5:  Log likelihood =  903.35393
    Iteration 6:  Log likelihood =    1123.45
    Iteration 7:  Log likelihood =  1140.2874
    Iteration 8:  Log likelihood =  1141.2526
    Iteration 9:  Log likelihood =  1141.2566
    Iteration 10: Log likelihood =  1141.2566
```

Structural vector autoregression

```
 ( 1)  [/A]1_1 = 1
 ( 2)  [/A]1_2 = 0
 ( 3)  [/A]1_3 = 0
 ( 4)  [/A]1_4 = 0
 ( 5)  [/A]2_2 = 1
 ( 6)  [/A]2_3 = 0
 ( 7)  [/A]2_4 = 0
 ( 8)  [/A]3_3 = 1
 ( 9)  [/A]3_4 = 0
 (10)  [/A]4_4 = 1
 (11)  [/B]1_2 = 0
 (12)  [/B]1_3 = 0
 (13)  [/B]1_4 = 0
 (14)  [/B]2_1 = 0
 (15)  [/B]2_3 = 0
 (16)  [/B]2_4 = 0
 (17)  [/B]3_1 = 0
 (18)  [/B]3_2 = 0
 (19)  [/B]3_4 = 0
 (20)  [/B]4_1 = 0
 (21)  [/B]4_2 = 0
 (22)  [/B]4_3 = 0
```

Sample: **2000m2** thru **2019m12** Number of obs = **239**
Exactly identified model Log likelihood = **1141.257**

	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
/A						
1_1	**1**	(constrained)				
2_1	**-.0118214**	**.0040088**	**-2.95**	**0.003**	**-.0196785**	**-.0039643**
3_1	**-.3751618**	**.8868091**	**-0.42**	**0.672**	**-2.113276**	**1.362952**
4_1	**.097546**	**.0481201**	**2.03**	**0.043**	**.0032322**	**.1918597**
1_2	**0**	(constrained)				
2_2	**1**	(constrained)				
3_2	**14.41956**	**14.05586**	**1.03**	**0.305**	**-13.12942**	**41.96853**
4_2	**1.104209**	**.7640921**	**1.45**	**0.148**	**-.3933836**	**2.601802**
1_3	**0**	(constrained)				
2_3	**0**	(constrained)				
3_3	**1**	(constrained)				
4_3	**-.0052758**	**.0035086**	**-1.50**	**0.133**	**-.0121525**	**.001601**
1_4	**0**	(constrained)				
2_4	**0**	(constrained)				
3_4	**0**	(constrained)				
4_4	**1**	(constrained)				
/B						
1_1	**.0829924**	**.003796**	**21.86**	**0.000**	**.0755524**	**.0904324**
2_1	**0**	(constrained)				
3_1	**0**	(constrained)				
4_1	**0**	(constrained)				
1_2	**0**	(constrained)				
2_2	**.0051434**	**.0002353**	**21.86**	**0.000**	**.0046823**	**.0056045**
3_2	**0**	(constrained)				
4_2	**0**	(constrained)				
1_3	**0**	(constrained)				
2_3	**0**	(constrained)				
3_3	**1.117653**	**.0511203**	**21.86**	**0.000**	**1.017459**	**1.217847**
4_3	**0**	(constrained)				
1_4	**0**	(constrained)				
2_4	**0**	(constrained)				
3_4	**0**	(constrained)				
4_4	**.0606235**	**.0027729**	**21.86**	**0.000**	**.0551888**	**.0660582**

```
. 
. /* compute the inv(B)*A matrix */
. matrix A=e(A)

. matrix B=e(B)

. matrix BA = inv(B)*A

. /* compute reduced form epsilon_t residuals */
. var lpri lpro ligrea lrpo if Period>tm(2000m1)

Vector autoregression

Sample: 2000m2 thru 2019m12                     Number of obs     =       239
Log likelihood =   848.3584                     AIC               =  -6.797979
FPE            =   1.31e-08                     HQIC              =  -6.586961
Det(Sigma_ml)  =   9.70e-09                     SBIC              =  -6.274327

Equation           Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
lpri                   9     .114594   0.9830   13804.51   0.0000
lpro                   9     .008001   0.9841   14825.52   0.0000
ligrea                 9     1.47542   0.8577   1440.013   0.0000
lrpo                   9     .081359   0.9585   5525.825   0.0000
------------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lpri         |
        lpri |
         L1. |   1.031543    .065542    15.74   0.000     .9030827    1.160003
         L2. |  -.0488196   .0655629    -0.74   0.456    -.1773204    .0796813
             |
        lpro |
         L1. |   -.543099   .9221104    -0.59   0.556    -2.350402    1.264204
         L2. |   .0585194   .9262575     0.06   0.950    -1.756912    1.873951
             |
      ligrea |
         L1. |   -.001409   .0050594    -0.28   0.781    -.0113253    .0085073
         L2. |    .001189   .0050561     0.24   0.814    -.0087207    .0110988
             |
        lrpo |
         L1. |   .0609772   .0891623     0.68   0.494    -.1137777    .2357321
         L2. |  -.0005068   .0894578    -0.01   0.995    -.1758408    .1748272
             |
       _cons |   1.890857   .6390209     2.96   0.003     .6383992    3.143315
-------------+----------------------------------------------------------------
lpro         |
        lpri |
         L1. |    .004347   .0045763     0.95   0.342    -.0046224    .0133163
         L2. |  -.0048775   .0045777    -1.07   0.287    -.0138496    .0040947
             |
        lpro |
         L1. |   .9592392   .0643836    14.90   0.000     .8330497    1.085429
         L2. |   .0331146   .0646732     0.51   0.609    -.0936425    .1598716
             |
      ligrea |
         L1. |   .0005136   .0003533     1.45   0.146    -.0001788    .0012059
         L2. |  -.0003914    .000353    -1.11   0.268    -.0010834    .0003005
             |
        lrpo |
         L1. |   .0126148   .0062255     2.03   0.043      .000413    .0248165
         L2. |  -.0116823   .0062461    -1.87   0.061    -.0239245    .0005599
             |
       _cons |   .0311188   .0446177     0.70   0.486    -.0563304    .1185679
-------------+----------------------------------------------------------------
ligrea       |
        lpri |
         L1. |   1.191882   .8438633     1.41   0.158    -.4620597    2.845824
         L2. |  -1.205254   .8441316    -1.43   0.153    -2.859722    .4492131
             |
        lpro |
```

L1.	-9.122932	11.87231	-0.77	0.442	-32.39223	14.14637
L2.	6.247787	11.9257	0.52	0.600	-17.12616	29.62174
ligrea						
L1.	.8977231	.0651407	13.78	0.000	.7700496	1.025396
L2.	.0026164	.065098	0.04	0.968	-.1249734	.1302061
lrpo						
L1.	1.486564	1.147978	1.29	0.195	-.7634315	3.73656
L2.	-1.511413	1.151782	-1.31	0.189	-3.768865	.7460383
_cons	12.52106	8.227491	1.52	0.128	-3.604523	28.64665
lrpo						
lpri						
L1.	-.035083	.0465331	-0.75	0.451	-.1262861	.0561202
L2.	.0464267	.0465479	1.00	0.319	-.0448055	.1376588
lpro						
L1.	-.0006364	.6546737	-0.00	0.999	-1.283773	1.2825
L2.	.1314577	.657618	0.20	0.842	-1.15745	1.420365
ligrea						
L1.	.0049832	.003592	1.39	0.165	-.0020571	.0120235
L2.	-.001918	.0035897	-0.53	0.593	-.0089536	.0051177
lrpo						
L1.	1.204628	.0633029	19.03	0.000	1.080557	1.328699
L2.	-.2588484	.0635126	-4.08	0.000	-.3833308	-.1343659
_cons	-.3904982	.4536877	-0.86	0.389	-1.27971	.4987134

```
190 . capture drop upsilon*

191 . predict double upsilon1 if Period>tm(2000m1),residual eq(#1)
    (481 missing values generated)

192 . predict double upsilon2 if Period>tm(2000m1),residual eq(#2)
    (481 missing values generated)

193 . predict double upsilon3 if Period>tm(2000m1),residual eq(#3)
    (481 missing values generated)

194 . predict double upsilon4 if Period>tm(2000m1),residual eq(#4)
    (481 missing values generated)

195 . /* store the epsilon* variables in the epsilon matrix */
196 . mkmat upsilon*, matrix(upsilon)

197 . /* compute e_t matrix of structural shocks */
198 . matrix u = (BA*upsilon')'

199 . /* store columns of e as variables e1, e2, and e3 */
200 . svmat double u

201 .
202 . label variable upsilon1 "Reduced-form shocks - PRI (Robustness)"

203 . label variable u1 "Structural shocks - PRI (Robustness)"
```

```
204 .
205 . twoway (tsline u1 if Period>tm(2000m1)) (tsline epsilon1 ///
    > if Period>tm(2000m1), yaxis(1)), ///
    >  name(G1R, replace) legend(position(6)) graphregion(margin(r+5))

206 .
207 . graph export "G1R.svg", replace
    file G1R.svg saved as SVG format

208 . graph export "G1R.png", as(png) width(4000) replace
    file G1R.png saved as PNG format

209 . graph export "G1R.pdf", as(pdf) replace
    file G1R.pdf saved as PDF format

210 .
211 . irf set comparemodels.irf, replace
    (file comparemodels.irf created)
    (file comparemodels.irf now active)

212 . quietly lpirf lpro ligrea lrpo, step(48) lags(1/24) ///
    >   exog(L(0/24).u1) vce(robust)

213 . irf create lpmodel
    (file comparemodels.irf updated)

214 .
215 . quietly var lpro ligrea lrpo, lags(1/24)            ///
    >   exog(L(0/24).u1)

216 . irf create varmodel, step(48)
    (file comparemodels.irf updated)

217 .
218 . irf graph dm, impulse(u1) response(lrpo)   ///
    >   irf(lpmodel varmodel) level(95) name(G2R, replace) ///
    >     xline(0 10 20 30 40 50, lcolor(blue)) yline(-.05 0 .05 .1, lcolor(blue))

219 .
220 . graph export "G2R.svg", replace
    file G2R.svg saved as SVG format

221 . graph export "G2R.png", as(png) width(4000) replace
    file G2R.png saved as PNG format

222 . graph export "G2R.pdf", as(pdf) replace
    file G2R.pdf saved as PDF format

223 .
224 . /* GPR */
225 .
226 . matrix A = (1,0,0,0\.,1,0,0\.,.,1,0\.,.,.,1)

227 . matlist A
```

	c1	c2	c3	c4
r1	**1**	**0**	**0**	**0**
r2	**.**	**1**	**0**	**0**
r3	**.**	**.**	**1**	**0**
r4	**.**	**.**	**.**	**1**

```
228 .
229 . matrix B = (.,0,0,0\0,.,0,0\0,0,.,0\0,0,0,.)

230 . matlist B

             |        c1         c2         c3         c4
-------------+------------------------------------------------
          r1 |         .
          r2 |         0          .
          r3 |         0          0          .
          r4 |         0          0          0          .

231 .
232 . svar gprcn lpro ligrea lrpo if Period>tm(2000m1), aeq(A) beq(B) ///
> lags(1/24)
Estimating short-run parameters

Iteration 0:  Log likelihood = -1294.2116
Iteration 1:  Log likelihood = -484.18673
Iteration 2:  Log likelihood = -404.56558
Iteration 3:  Log likelihood = -194.34599
Iteration 4:  Log likelihood =  187.25055
Iteration 5:  Log likelihood =   588.0996
Iteration 6:  Log likelihood =  855.64494
Iteration 7:  Log likelihood =  987.12974
Iteration 8:  Log likelihood =  1005.7811
Iteration 9:  Log likelihood =  1006.5395
Iteration 10: Log likelihood =  1006.5401
Iteration 11: Log likelihood =  1006.5401

Structural vector autoregression

 ( 1)  [/A]1_1 = 1
 ( 2)  [/A]1_2 = 0
 ( 3)  [/A]1_3 = 0
 ( 4)  [/A]1_4 = 0
 ( 5)  [/A]2_2 = 1
 ( 6)  [/A]2_3 = 0
 ( 7)  [/A]2_4 = 0
 ( 8)  [/A]3_3 = 1
 ( 9)  [/A]3_4 = 0
 (10)  [/A]4_4 = 1
 (11)  [/B]1_2 = 0
 (12)  [/B]1_3 = 0
 (13)  [/B]1_4 = 0
 (14)  [/B]2_1 = 0
 (15)  [/B]2_3 = 0
 (16)  [/B]2_4 = 0
 (17)  [/B]3_1 = 0
 (18)  [/B]3_2 = 0
 (19)  [/B]3_4 = 0
 (20)  [/B]4_1 = 0
 (21)  [/B]4_2 = 0
 (22)  [/B]4_3 = 0

Sample: 2000m2 thru 2019m12                     Number of obs     =       239
Exactly identified model                        Log likelihood    =   1006.54

------------------------------------------------------------------------------
             |      Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
/A           |
         1_1 |              1  (constrained)
         2_1 |     -.0079562   .0026317    -3.02   0.003    -.0131142   -.0027981
         3_1 |     -.3761626   .5528259    -0.68   0.496    -1.459681    .7073563
         4_1 |      .0054321   .0317605     0.17   0.864    -.0568173    .0676815
         1_2 |              0  (constrained)
         2_2 |              1  (constrained)
         3_2 |      9.810127   13.33532     0.74   0.462    -16.32662    35.94688
         4_2 |      1.196497   .7662548     1.56   0.118    -.3053345    2.698329
         1_3 |              0  (constrained)
         2_3 |              0  (constrained)
         3_3 |              1  (constrained)
```

4_3	-.0038824	.0037126	-1.05	0.296	-.011159	.0033942
1_4	0	(constrained)				
2_4	0	(constrained)				
3_4	0	(constrained)				
4_4	1	(constrained)				
/B						
1_1	.1326207	.0060659	21.86	0.000	.1207317	.1445097
2_1	0	(constrained)				
3_1	0	(constrained)				
4_1	0	(constrained)				
1_2	0	(constrained)				
2_2	.0053957	.0002468	21.86	0.000	.004912	.0058794
3_2	0	(constrained)				
4_2	0	(constrained)				
1_3	0	(constrained)				
2_3	0	(constrained)				
3_3	1.11237	.0508786	21.86	0.000	1.01265	1.21209
4_3	0	(constrained)				
1_4	0	(constrained)				
2_4	0	(constrained)				
3_4	0	(constrained)				
4_4	.0638452	.0029202	21.86	0.000	.0581216	.0695687

```
233 .
234 . /* compute the inv(B)*A matrix */
235 . matrix A=e(A)

236 . matrix B=e(B)

237 . matrix BA = inv(B)*A

238 . /* compute reduced form epsilon_t residuals */
239 . var gprcn lpro ligrea lrpo if Period>tm(2000m1)

Vector autoregression

Sample: 2000m2 thru 2019m12                     Number of obs     =        239
Log likelihood =   752.5675                     AIC               =  -5.996381
FPE            =   2.92e-08                     HQIC              =  -5.785364
Det(Sigma_ml)  =   2.16e-08                     SBIC              =   -5.47273
```

Equation	Parms	RMSE	R-sq	chi2	P>chi2
gprcn	9	.167708	0.5207	259.6591	0.0000
lpro	9	.008019	0.9841	14758.78	0.0000
ligrea	9	1.47327	0.8581	1444.922	0.0000
lrpo	9	.08174	0.9582	5472.14	0.0000

	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
gprcn						
gprcn						
L1.	.4443778	.0622216	7.14	0.000	.3224256	.56633
L2.	.1782056	.0623994	2.86	0.004	.0559051	.3005062
lpro						
L1.	-3.018679	1.338652	-2.26	0.024	-5.642388	-.3949694
L2.	3.850703	1.339876	2.87	0.004	1.224594	6.476811
ligrea						
L1.	.0023119	.0074545	0.31	0.756	-.0122986	.0169225
L2.	-.0005368	.0073999	-0.07	0.942	-.0150402	.0139667
lrpo						
L1.	.1532182	.1293141	1.18	0.236	-.1002328	.4066692
L2.	-.2082281	.1283588	-1.62	0.105	-.4598068	.0433506
_cons	-3.226462	.9841889	-3.28	0.001	-5.155436	-1.297487

lpro						
gprcn						
L1.	-.0013264	.0029751	-0.45	0.656	-.0071576	.0045047
L2.	.0018845	.0029836	0.63	0.528	-.0039633	.0077323
lpro						
L1.	.9722475	.0640079	15.19	0.000	.8467943	1.097701
L2.	.0205195	.0640664	0.32	0.749	-.1050484	.1460874
ligrea						
L1.	.0005198	.0003564	1.46	0.145	-.0001788	.0012184
L2.	-.0003937	.0003538	-1.11	0.266	-.0010872	.0002998
lrpo						
L1.	.0116968	.0061832	1.89	0.059	-.000422	.0238156
L2.	-.0112313	.0061375	-1.83	0.067	-.0232606	.000798
_cons	.0303798	.0470592	0.65	0.519	-.0618545	.1226141
ligrea						
gprcn						
L1.	.639055	.5465994	1.17	0.242	-.4322601	1.71037
L2.	.1964158	.5481607	0.36	0.720	-.8779594	1.270791
lpro						
L1.	-7.986964	11.75967	-0.68	0.497	-31.0355	15.06157
L2.	2.842411	11.77043	0.24	0.809	-20.2272	25.91203
ligrea						
L1.	.8883138	.0654857	13.56	0.000	.7599641	1.016664
L2.	.0047228	.0650056	0.07	0.942	-.1226859	.1321315
lrpo						
L1.	1.304938	1.135987	1.15	0.251	-.9215566	3.531432
L2.	-1.189063	1.127596	-1.05	0.292	-3.39911	1.020984
_cons	21.442	8.645818	2.48	0.013	4.49651	38.38749
lrpo						
gprcn						
L1.	-.0010515	.0303266	-0.03	0.972	-.0604906	.0583877
L2.	-.0183931	.0304133	-0.60	0.545	-.078002	.0412158
lpro						
L1.	-.1172443	.6524548	-0.18	0.857	-1.396032	1.161544
L2.	.2327742	.6530515	0.36	0.722	-1.047183	1.512732
ligrea						
L1.	.005088	.0036333	1.40	0.161	-.0020331	.0122092
L2.	-.0020696	.0036067	-0.57	0.566	-.0091385	.0049993
lrpo						
L1.	1.214098	.0630273	19.26	0.000	1.090566	1.337629
L2.	-.2573826	.0625617	-4.11	0.000	-.3800013	-.134764
_cons	-.3469605	.4796906	-0.72	0.469	-1.287137	.5932159

```
240 . capture drop epsilon_*

241 . predict double upsilon_1 if Period>tm(2000m1),residual eq(#1)
(481 missing values generated)
```

```
242 . predict double upsilon_2 if Period>tm(2000m1),residual eq(#2)
    (481 missing values generated)

243 . predict double upsilon_3 if Period>tm(2000m1),residual eq(#3)
    (481 missing values generated)

244 . predict double upsilon_4 if Period>tm(2000m1),residual eq(#4)
    (481 missing values generated)

245 . /* store the epsilon* variables in the epsilon matrix */
246 . mkmat upsilon_*, matrix(upsilon_)

247 . /* compute e_t matrix of structural shocks */
248 . matrix u_ = (BA*upsilon_')'

249 . /* store columns of e as variables e1, e2, and e3 */
250 . svmat double u_

251 .
252 . label variable upsilon_1 "Reduced-form shocks - GPR (Robustness)"

253 . label variable u_1 "Structural shocks - GPR (Robustness)"

254 .
255 . twoway (tsline u_1 if Period>tm(2000m1)) (tsline upsilon_1 ///
    > if Period>tm(2000m1), yaxis(1)), ///
    >  name(G3R, replace) legend(position(6)) graphregion(margin(r+5))

256 .
257 . graph export "G3R.svg", as(svg) replace
    file G3R.svg saved as SVG format

258 . graph export "G3R.png", as(png) width(4000) replace
    file G3R.png saved as PNG format

259 . graph export "G3R.pdf", as(pdf) replace
    file G3R.pdf saved as PDF format

260 .
261 . irf set comparemodels1.irf, replace
    (file comparemodels1.irf created)
    (file comparemodels1.irf now active)

262 . quietly lpirf lpro ligrea lrpo, step(48) lags(1/24) ///
    >   exog(L(0/24).u_1) vce(robust)

263 . irf create lpmodel1
    (file comparemodels1.irf updated)

264 .
265 . quietly var lpro ligrea lrpo, lags(1/24)            ///
    >   exog(L(0/24).u_1)

266 . irf create varmodel1, step(48)
    (file comparemodels1.irf updated)

267 .
268 . irf graph dm, impulse(u_1) response(lrpo)   ///
    >   irf(lpmodel1 varmodel1) level(95) name(G4R, replace) ///
    >     xline(0 10 20 30 40 50, lcolor(blue)) yline(-.05 0 .05 .1, lcolor(blue))
```

```
269 .
270 . graph export "G4R.svg", replace
    file G4R.svg saved as SVG format

271 . graph export "G4R.png", as(png) width(4000) replace
    file G4R.png saved as PNG format

272 . graph export "G4R.pdf", as(pdf) replace
    file G4R.pdf saved as PDF format

273 .
274 . twoway (tsline u1 if Period>tm(2000m1)) (tsline u_1 ///
    > if Period>tm(2000m1), yaxis(1)), ///
    >  name(G5R, replace) legend(position(6)) graphregion(margin(r+5))

275 .
276 . graph export "G5R.svg", replace
    file G5R.svg saved as SVG format

277 . graph export "G5R.png", as(png) width(4000) replace
    file G5R.png saved as PNG format

278 . graph export "G5R.pdf", as(pdf) replace
    file G5R.pdf saved as PDF format

279 .
280 . pwcorr lrpo u1 u_1, obs sig listwise star(5) sidak
```

	lrpo	u1	u_1
lrpo	**1.0000**		
	239		
u1	**-0.0268**	**1.0000**	
	0.9674		
	239	**239**	
u_1	**-0.0059**	**0.0809**	**1.0000**
	0.9996	**0.5123**	
	239	**239**	**239**

```
281 .
282 . twoway (scatter lrpo u1) (lfit lrpo u1), name(G6R, replace)

283 . graph export "G6R.svg", replace
    file G6R.svg saved as SVG format

284 . graph export "G6R.png", as(png) width(4000) replace
    file G6R.png saved as PNG format

285 . graph export "G6R.pdf", as(pdf) replace
    file G6R.pdf saved as PDF format

286 .
287 . twoway (scatter lrpo u_1) (lfit lrpo u_1), name(G7R, replace)

288 . graph export "G7R.svg", replace
    file G7R.svg saved as SVG format
```

```
289 . graph export "G7R.png", as(png) width(4000) replace
    file G7R.png saved as PNG format

290 . graph export "G7R.pdf", as(pdf) replace
    file G7R.pdf saved as PDF format

291 .
292 . **############ Expectations ********************************
293 .
294 . use database_pri_gpr.dta, clear

295 .
296 . merge 1:1 Period using expectations

        Result                      Number of obs
        ------------------------------------------
        Not matched                            55
            from master                        12  (_merge==1)
            from using                         43  (_merge==2)

        Matched                               708  (_merge==3)
        ------------------------------------------

297 .
298 . drop _merge

299 .
300 . // PRI ----> Expectations
301 .
302 . graph drop _all

303 .
304 . sum BCI CLI CCI lpri

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
         BCI |        571    99.93125    1.065472   95.06452    101.863
         CLI |        751    100.2146    1.345907   89.72672    104.628
         CCI |        607    99.98832    1.177633   95.47003   101.9302
        lpri |        720    -.305086    1.281585  -2.174752   1.458615

305 .
306 . tvgc CCI lpri, trend window(80) sizecontrol(60) p(2)     ///
    >  d(1) seed(123) boot(499) robust prefix(CCI) graph pdf   ///
    >  notitle

    Time-varying LA-VAR Granger causality test including trend, 1973m1 - 2019m12

    TVGC robust test statistics for H0: CCI is GC

                |   Max_Wald_forward    Max_Wald_rolling  Max_Wald_recursive
----------------+-------------------------------------------------------------
          lpri  |               26.479               54.477               55.587

    90th percentile of test statistics [499 replications]

                |   Max_Wald_forward    Max_Wald_rolling  Max_Wald_recursive
----------------+-------------------------------------------------------------
          lpri  |                5.993                5.957                6.646

    95th percentile of test statistics [499 replications]

                |   Max_Wald_forward    Max_Wald_rolling  Max_Wald_recursive
----------------+-------------------------------------------------------------
          lpri  |                7.781                7.628                8.686

    99th percentile of test statistics [499 replications]

                |   Max_Wald_forward    Max_Wald_rolling  Max_Wald_recursive
----------------+-------------------------------------------------------------
          lpri  |               13.040               12.582               13.507
```

```
. 
. tvgc BCI lpri, trend window(80) sizecontrol(60) p(2)      ///
>  d(1) seed(123) boot(499) robust prefix(BCI) graph pdf    ///
>  notitle
```

Time-varying LA-VAR Granger causality test including trend, 1975m12 - 2019m12

TVGC robust test statistics for H0: BCI is GC

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
lpri	**10.515**	**11.731**	**13.227**

90th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
lpri	**4.837**	**5.477**	**6.138**

95th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
lpri	**6.428**	**7.335**	**7.605**

99th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
lpri	**11.711**	**12.380**	**12.440**

```
. 
. tvgc CLI lpri, trend window(80) sizecontrol(60) p(2)      ///
>  d(1) seed(123) boot(499) robust prefix(CLI) graph pdf    ///
>  notitle
```

Time-varying LA-VAR Granger causality test including trend, 1961m1 - 2019m12

TVGC robust test statistics for H0: CLI is GC

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
lpri	**12.812**	**33.829**	**39.248**

90th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
lpri	**6.016**	**6.285**	**6.863**

95th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
lpri	**7.582**	**8.352**	**8.953**

99th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
lpri	**10.712**	**11.926**	**12.600**

```
311 .
312 . // GPRCN ----> Expectations
313 .
314 . sum BCI CLI CCI gprcn
```

Variable	Obs	Mean	Std. dev.	Min	Max
BCI	**571**	**99.93125**	**1.065472**	**95.06452**	**101.863**
CLI	**751**	**100.2146**	**1.345907**	**89.72672**	**104.628**
CCI	**607**	**99.98832**	**1.177633**	**95.47003**	**101.9302**
gprcn	**420**	**.3757173**	**.2305926**	**.07034**	**1.521136**

```
315 .
316 . tvgc CCI gprcn, trend window(80) sizecontrol(40) p(2)     ///
    >  d(1) seed(123) boot(499) robust prefix(CCI) graph pdf    ///
    >  notitle
```

Time-varying LA-VAR Granger causality test including trend, 1985m1 - 2019m12

TVGC robust test statistics for H0: CCI is GC

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**7.674**	**10.965**	**14.298**

90th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**6.100**	**6.586**	**7.129**

95th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**7.759**	**8.104**	**8.696**

99th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**11.653**	**11.794**	**12.486**

```
317 .
318 . tvgc BCI gprcn, trend window(80) sizecontrol(40) p(2)     ///
    >  d(1) seed(123) boot(499) robust prefix(BCI) graph pdf    ///
    >  notitle
```

Time-varying LA-VAR Granger causality test including trend, 1985m1 - 2019m12

TVGC robust test statistics for H0: BCI is GC

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**10.214**	**9.963**	**13.562**

90th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**5.907**	**6.330**	**6.566**

95th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**7.163**	**7.735**	**8.200**

99th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**9.336**	**9.875**	**10.775**

```
319 .
320 . tvgc CLI gprcn, trend window(80) sizecontrol(40) p(2)     ///
    >  d(1) seed(123) boot(499) robust prefix(CLI) graph pdf    ///
    >  notitle
```

Time-varying LA-VAR Granger causality test including trend, 1985m1 - 2019m12

TVGC robust test statistics for H0: CLI is GC

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**19.021**	**18.997**	**30.649**

90th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**6.155**	**6.423**	**6.630**

95th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**7.574**	**7.972**	**8.116**

99th percentile of test statistics [499 replications]

	Max_Wald_forward	Max_Wald_rolling	Max_Wald_recursive
gprcn	**11.559**	**11.553**	**11.856**

```
321 .
322 . save database_pri_gpr_final.dta, replace
    file database_pri_gpr_final.dta saved

323 .
324 . log close _all
          name:  <unnamed>
           log:  C:\Users\jamel\Dropbox\latex\PROJECTS\23-05-geopolitical-risk-pol-tension-oil-price\Data and command\lp
      log type:  smcl
     closed on:  20 Aug 2023, 18:48:18
```