Napassorn Dechnitiratn
6004041475

Assignment 6

Due: 22/11/2018

The following VARs models:

$$Y_t = A_0 + A_1 Y_{t-1} + \in_t$$

where: $Y_t = \begin{pmatrix} rspot_t \\ rfuture_t \end{pmatrix}$, $A_0 = \begin{pmatrix} a_{10} \\ a_{20} \end{pmatrix}$, $A_1 = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$, $\in_t = \begin{pmatrix} e_{1t} \\ e_{2t} \end{pmatrix}$

From the data set assign04.dta:

Requirements:

1. Estimate VARs models using spot return (*rspot*) and future return (*rfuture*) as endogenous variables and determine the most appropriated lags models using SBIC.
2. Perform stability test and Granger exogeneity test.
3. Perform Impulse response analysis and determine which variable has more impact.
4. Perform Forecast error variance decomposition and determine variable that has more impact on each endogenous variable.

1. Assume that maximum number of lag term = 7

```
. varsoc rspot rfuture, maxlag(7)
```

Selection-order criteria
Sample: 9 - 7684 Number of obs = 7676

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	76676.5				7.2e-12	-19.9777	-19.9771	-19.9759
1	76847.6	342.21	4	0.000	6.9e-12	-20.0213	-20.0194	-20.0158
2	76936.9	178.41	4	0.000	6.8e-12	-20.0435	-20.0404	-20.0344
3	76969.7	65.686	4	0.000	6.7e-12	-20.051	-20.0466	-20.0383
4	76986.4	33.346	4	0.000	6.7e-12	-20.0543	-20.0487	-20.038
5	77024.3	75.872	4	0.000	6.6e-12	-20.0631	-20.0563	-20.0432
6	77055.1	61.489	4	0.000	6.6e-12	-20.0701	-20.062	-20.0466*
7	77065.3	20.554*	4	0.000	6.6e-12*	-20.0717*	-20.0624*	-20.0446

Endogenous: rspot rfuture
Exogenous: _cons

By using SBIC, the most appropriate number of lags is 6 since it gives the lowest SBIC.

```
. var rspot rfuture, lag(1/6)
```

Vector autoregression

Sample: 8 - 7684 Number of obs = 7,677
Log likelihood = 77062.5 AIC = -20.06943
FPE = 6.59e-12 HQIC = -20.06136
Det(Sigma_ml) = 6.55e-12 SBIC = -20.0459

Equation	Parms	RMSE	R-sq	chi2	P>chi2
rspot	13	.001777	0.0159	124.0308	0.0000
rfuture	13	.002042	0.0211	165.0864	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
rspot						
rspot						
L1.	-.0429887	.0160995	-2.67	0.008	-.0745432	-.0114342
L2.	-.1255145	.0163803	-7.66	0.000	-.1576194	-.0934097
L3.	-.0654555	.0165559	-3.95	0.000	-.0979044	-.0330066
L4.	-.0555308	.0165648	-3.35	0.001	-.0879973	-.0230644
L5.	-.0646528	.0163598	-3.95	0.000	-.0967173	-.0325882
L6.	-.0420281	.0160563	-2.62	0.009	-.0734979	-.0105584
rfuture						
L1.	.1025108	.0140081	7.32	0.000	.0750554	.1299661
L2.	.0827253	.0143869	5.75	0.000	.0545274	.1109231
L3.	.0530446	.0145602	3.64	0.000	.0245072	.081582
L4.	.057478	.0145501	3.95	0.000	.0289603	.0859958
L5.	.0435619	.0143967	3.03	0.002	.0153449	.0717788
L6.	.0372007	.0140183	2.65	0.008	.0097254	.064676
_cons	.0000232	.0000203	1.14	0.252	-.0000165	.0000629

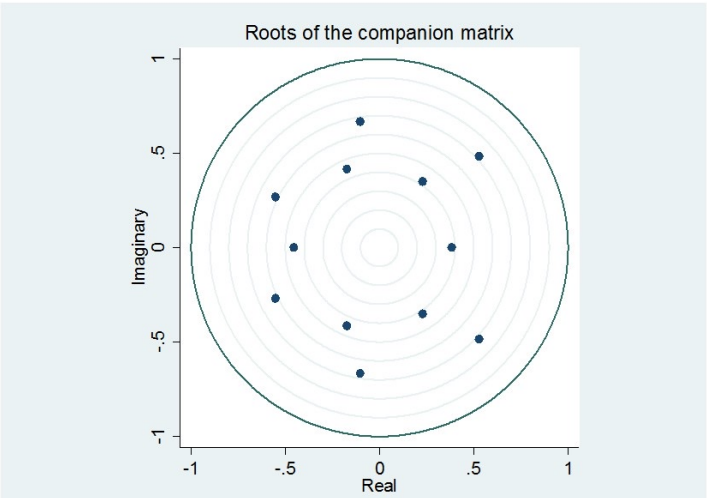
rfuture						
rspot						
L1.	.2117743	.0185008	11.45	0.000	.1755133	.2480352
L2.	.0743206	.0188235	3.95	0.000	.0374272	.1112139
L3.	.0828566	.0190252	4.36	0.000	.0455679	.1201454
L4.	.0448446	.0190355	2.36	0.018	.0075357	.0821535
L5.	.0674903	.0187999	3.59	0.000	.0306433	.1043374
L6.	.0590473	.0184511	3.20	0.001	.0228838	.0952109
rfuture						
L1.	-.1623592	.0160974	-10.09	0.000	-.1939096	-.1308088
L2.	-.1054217	.0165328	-6.38	0.000	-.1378253	-.073018
L3.	-.0724314	.0167319	-4.33	0.000	-.1052253	-.0396376
L4.	-.042915	.0167203	-2.57	0.010	-.0756863	-.0101437
L5.	-.0604119	.016544	-3.65	0.000	-.0928375	-.0279863
L6.	-.0392965	.0161092	-2.44	0.015	-.0708699	-.0077232
_cons	.0000259	.0000233	1.11	0.266	-.0000198	.0000715

2.

```
. varstable, graph
```

Eigenvalue stability condition

Eigenvalue	Modulus
.5279554 + .4847924i	.716771
.5279554 - .4847924i	.716771
-.1022778 + .6675194i	.67531
-.1022778 - .6675194i	.67531
-.5513603 + .2689237i	.613448
-.5513603 - .2689237i	.613448
-.4536067	.453607
-.1726167 + .4151256i	.449584
-.1726167 - .4151256i	.449584
.2305361 + .3500458i	.419141
.2305361 - .3500458i	.419141
.3837855	.383786



All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.

```
. vargranger
```

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2	
rspot	rfuture	82.299	6	0.000	
rspot	ALL	82.299	6	0.000	< 0.05
rfuture	rspot	148.42	6	0.000	
rfuture	ALL	148.42	6	0.000	< 0.05

Since the p-values are smaller than 0.05 level of significance, the null hypotheses of one-direction relationship is rejected which means there exists interdependent relationship between rspot and rfuture.

3.

```
. irf create order1, order(rspot rfuture) step(6) set(irf01)
(file irf01.irf created)
(file irf01.irf now active)
(file irf01.irf updated)

. irf table irf, impulse(rspot rfuture) response(rspot rfuture)
```

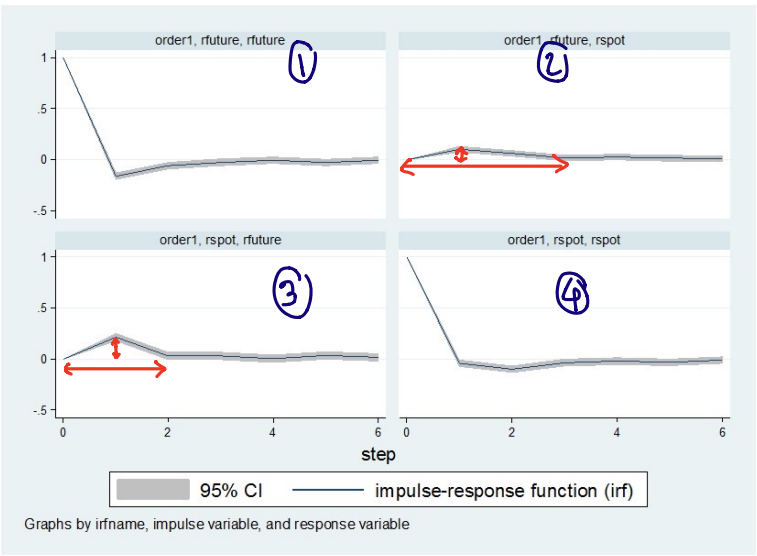
Results from order1

step	(1) irf	(1) Lower	(1) Upper	(2) irf	(2) Lower	(2) Upper	(3) irf	(3) Lower	(3) Upper
0	1	1	1	0	0	0	0	0	0
1	-.042989	-.074543	-.011434	.211774	.175513	.248035	.102511	.075055	.129966
2	-.101957	-.133505	-.070409	.030833	-.00561	.067276	.061675	.034224	.089126
3	-.034997	-.066566	-.003428	.030738	-.005677	.067153	.018216	-.009265	.045697
4	-.02148	-.052956	.009995	.002714	-.033596	.039023	.026291	-.001106	.053688
5	-.033647	-.06485	-.002443	.034962	-.001046	.070971	.01553	-.011653	.042713
6	-.010717	-.041519	.020085	.017646	-.017933	.053226	.006933	-.01982	.033686

step	(4) irf	(4) Lower	(4) Upper
0	1	1	1
1	-.162359	-.19391	-.130809
2	-.057352	-.089063	-.025641
3	-.025324	-.057023	.006376
4	-.004062	-.035665	.027541
5	-.029332	-.060699	.002035
6	-.003566	-.034475	.027344

```
95% lower and upper bounds reported
(1) irfname = order1, impulse = rspot, and response = rspot
(2) irfname = order1, impulse = rspot, and response = rfuture
(3) irfname = order1, impulse = rfuture, and response = rspot
(4) irfname = order1, impulse = rfuture, and response = rfuture

. irf graph irf, impulse(rspot rfuture) response(rspot rfuture)
```



According to the graphs, both rspot and rfuture seems to have no impact on each other in the long-run as the impacts for all are approaching zero.

However, in the short-run, as a shock occurs, it is more likely that rspot and rfuture both have large impacts on themselves rather than on one another.

From graph ② and ③, by looking at the magnitude, rspot has more impact on rfuture as compared to the impact of rfuture on rspot. But in terms of duration, the impact of rfuture on rspot seems to last longer than the impact of rspot on rfuture.

4.

```
. irf table fevd, impulse(rspot rfuture) response(rspot rfuture)
```

Results from order1

rspot → rfuture　　rfuture → rspot

step	(1) fevd	(1) Lower	(1) Upper	(2) fevd	(2) Lower	(2) Upper	(3) fevd	(3) Lower	(3) Upper
0	0	0	0	0	0	0	0	0	0
1	1	1	1	.500791	.484986	.516596	0	0	0
2	.993131	.989465	.996798	.496679	.480799	.512558	.006869	.003202	.010535
3	.990693	.98638	.995006	.495972	.480066	.511879	.009307	.004994	.01362
4	.990483	.986145	.994821	.495855	.479951	.51176	.009517	.005179	.013855
5	.990038	.98565	.994426	.495851	.479947	.511756	.009962	.005574	.01435
6	.989888	.985487	.994289	.495689	.479783	.511594	.010112	.005711	.014513

step	(4) fevd	(4) Lower	(4) Upper
0	0	0	0
1	.499209	.483404	.515014
2	.503321	.487442	.519201
3	.504028	.488121	.519934
4	.504145	.48824	.520049
5	.504149	.488244	.520053
6	.504311	.488406	.520217

95% lower and upper bounds reported
(1) irfname = order1, impulse = rspot, and response = rspot
(2) irfname = order1, impulse = rspot, and response = rfuture
(3) irfname = order1, impulse = rfuture, and response = rspot
(4) irfname = order1, impulse = rfuture, and response = rfuture

The results from FEVD are similar to IRF, rspot and rfuture are more likely to have more impacts on themselves than on each other. And rspot seems to has more impact on rfuture than rfuture on rspot.