DSC5211C QUANTITATIVE RISK MANAGEMENT

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Workshop 5: Multiple Equations Modeling

Quality Kitchens (Continued…)

sales - quarterly sales of Quality Kitchens meat loaf mix (thousands of dollars)
prom - funds spent on promotion activities in the quarter (thousands of dollars)
adv - funds spent on advertising during the quarter (thousands of dollars)
index - economic index of general economic conditions in Quality Kitchens market area

- One of your colleagues has developed the following model:

  Sales c adv adv(-1) prom prom(-1) dlog(index)

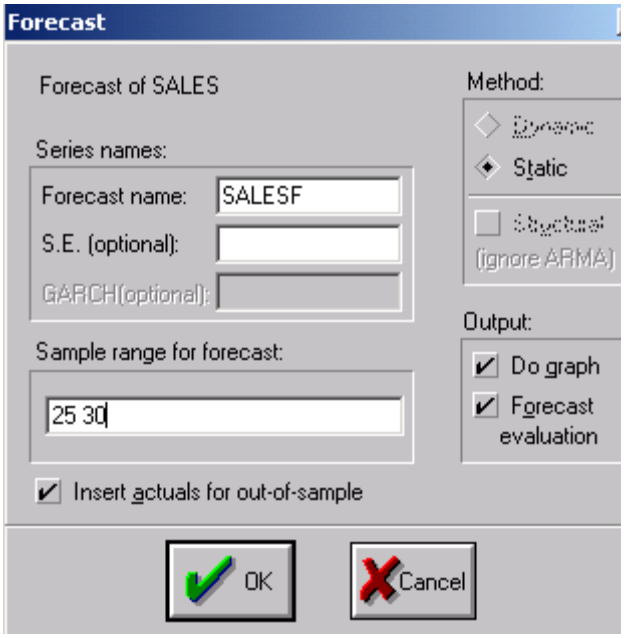
- Estimate the model using the first 20 observations.

Click: ***workfile window … Procs … Structure/Resize Current Page***
Date Specification. **End Date: 30**.

View the spreadsheet and edit the variables index, prom and adv inserting values for the observations 25,…, 30 [YOUR EXPECTATIONS FOR THESE VALUES], for example:

adv: 2, 17, 11, 56, 39, 44
prom: 19, 3, 21, 40, 45, 13
index: 116, 119, 120, 118, 119, 121

Click the **Forecast** button which can be found in the menu at the top of the current equation window. In the top right of the dialog box, try the **Static** forecasting **Method** and click OK.

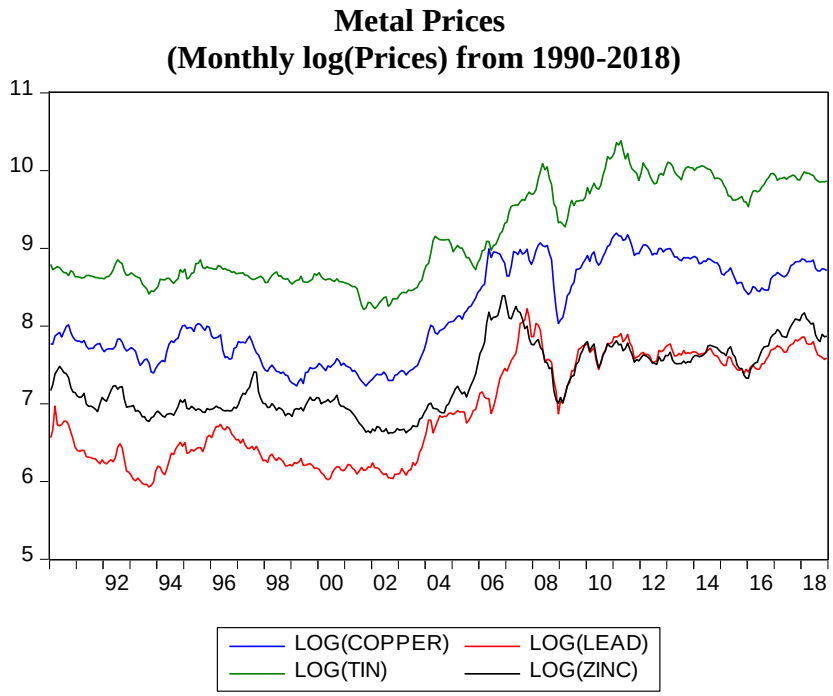


Plot SALES and SALESF in the same graph, and comment your results. How good are the forecasts?

VAR & COINTEGRATION: Precious Metals

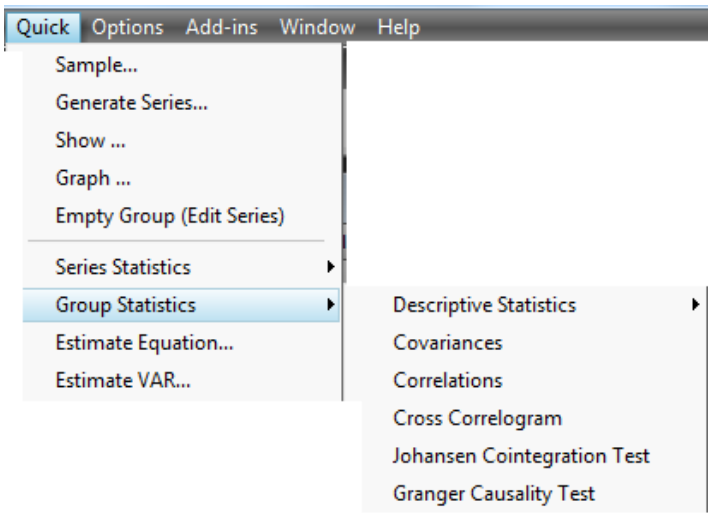
In this example we are going to analyse the relationship between metal prices. Open the file "session5.wf1" or import the data from the excel file "sessio5.xlsx", under the tab "metals" you will find the prices of aluminium, copper, lead, nickel, tin and zinc.

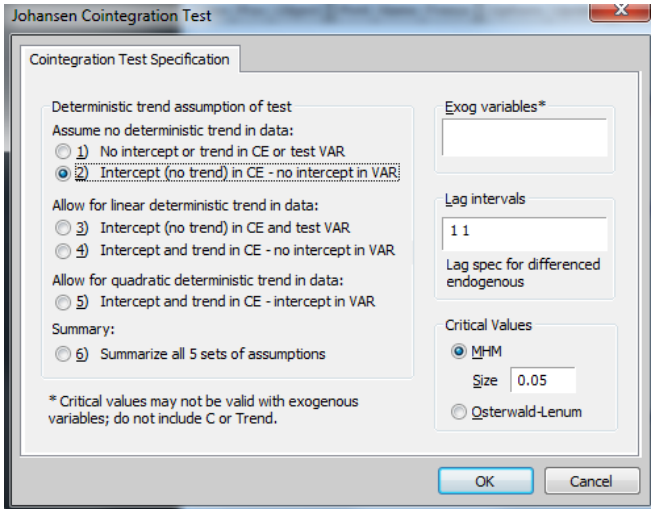
1. First you decided to take the log of the prices to reduce heteroscedasticity.



You think that the prices are non-stationary and possibly cointegrated.

1. First, check they are non-stationary!
2. Then, use the Johansen – Cointegration Test.





Sample (adjusted): 1990M03 2018M12
Included observations: 346 after adjustments
Trend assumption: No deterministic trend (restricted constant)
Series: LOG(COPPER) LOG(LEAD) LOG(TIN) LOG(ZINC)
Lags interval (in first differences): 1 to 1

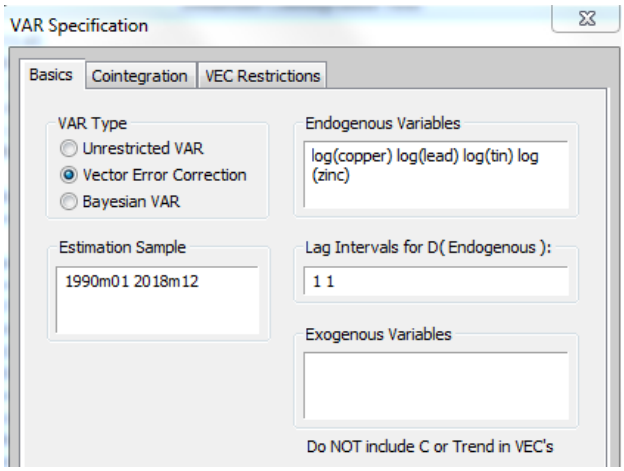
Unrestricted Cointegration Rank Test (Trace)

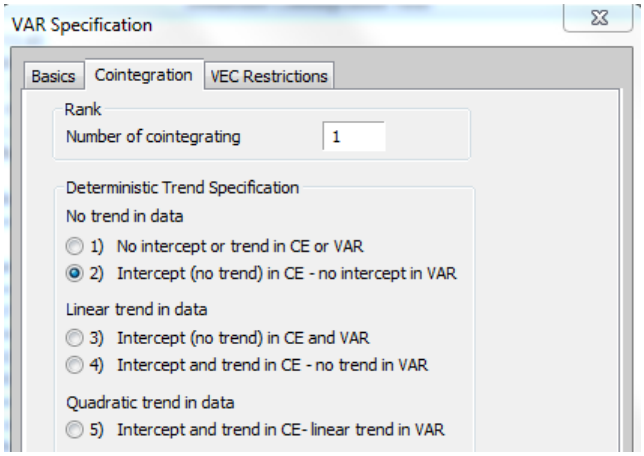
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.078118	54.58767	54.07904	0.0450
At most 1	0.044796	26.44455	35.19275	0.3177
At most 2	0.026528	10.58727	20.26184	0.5822
At most 3	0.003706	1.284661	9.164546	0.9101

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

What is the conclusion?

3. You decided to proceed and estimate a cointegration model with 1 cointegration equation.





Vector Error Correction Estimates

Sample (adjusted): 1990M03 2018M12
Included observations: 346 after adjustments
Standard errors in ( ) & t-statistics in [ ]

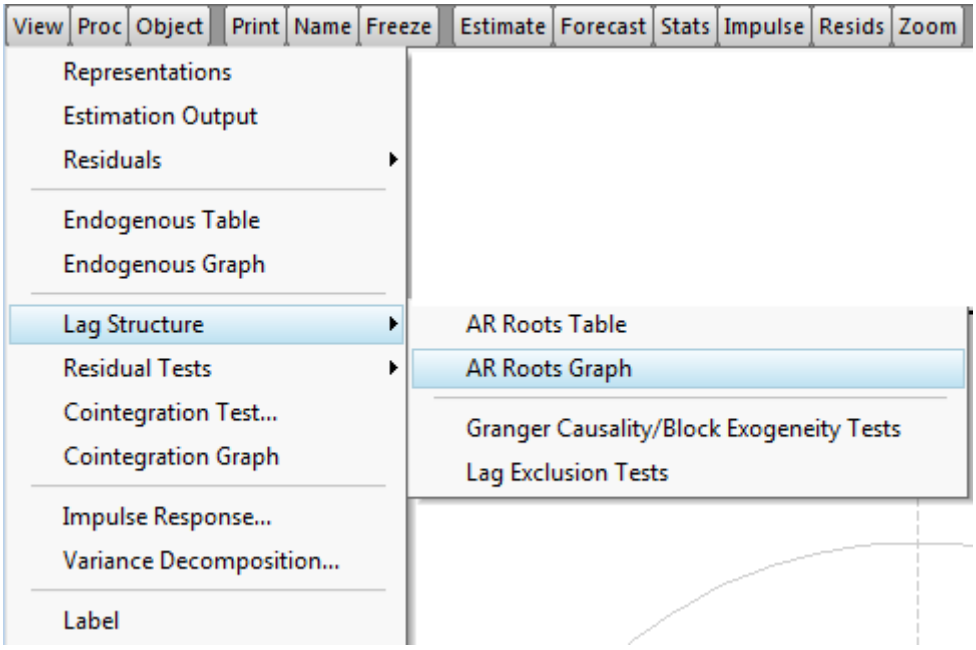
Cointegrating Eq:	CointEq1
LOG(COPPER(-1))	1.000000
LOG(LEAD(-1))	-2.535663 (0.45645) [-5.55520]
LOG(TIN(-1))	1.644632 (0.40814) [4.02953]
LOG(ZINC(-1))	0.166074 (0.34076) [0.48736]
C	-6.925281 (1.93706) [-3.57515]

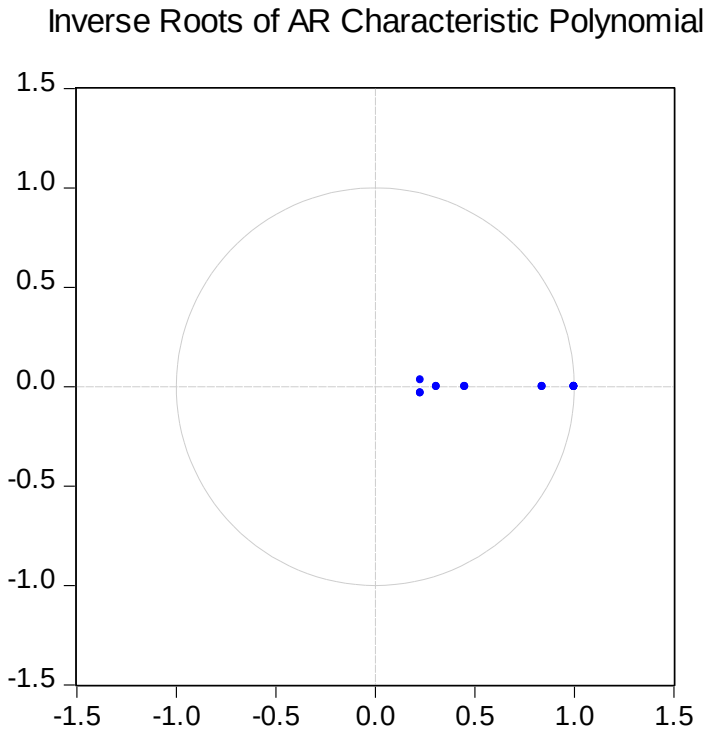
Interpret the equation.

The system of equations estimated is as follows. Interpret the result.
Which prices are the main drivers? How can you improve the model?

Error Correction:	D(LOG(COP...	D(LOG(LEAD))	D(LOG(TIN))	D(LOG(ZINC))
CointEq1	-0.018218	0.013266	-0.025830	-0.004341
	(0.00820)	(0.00982)	(0.00746)	(0.00838)
	[-2.22041]	[1.35031]	[-3.46049]	[-0.51821]
D(LOG(COPPER(-1)))	0.420624	0.089441	0.091521	0.191225
	(0.06844)	(0.08195)	(0.06226)	(0.06987)
	[6.14621]	[1.09147]	[1.46997]	[2.73686]
D(LOG(LEAD(-1)))	-0.089978	0.227445	0.016599	-0.052085
	(0.05860)	(0.07017)	(0.05331)	(0.05983)
	[-1.53538]	[3.24128]	[0.31135]	[-0.87054]
D(LOG(TIN(-1)))	-0.021968	-0.153571	0.200727	-0.221108
	(0.06506)	(0.07791)	(0.05919)	(0.06643)
	[-0.33765]	[-1.97125]	[3.39117]	[-3.32867]
D(LOG(ZINC(-1)))	0.032673	0.024900	-0.016137	0.303236
	(0.06797)	(0.08139)	(0.06184)	(0.06939)
	[0.48070]	[0.30595]	[-0.26096]	[4.36983]

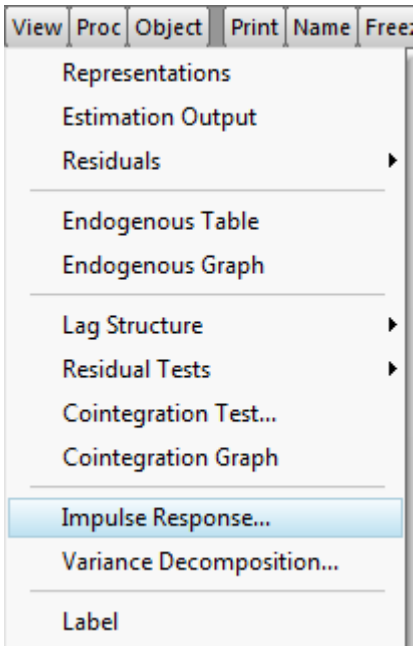
You finally need to analyse the stability conditions to test if any of the parameters or relationship between them is explosive.



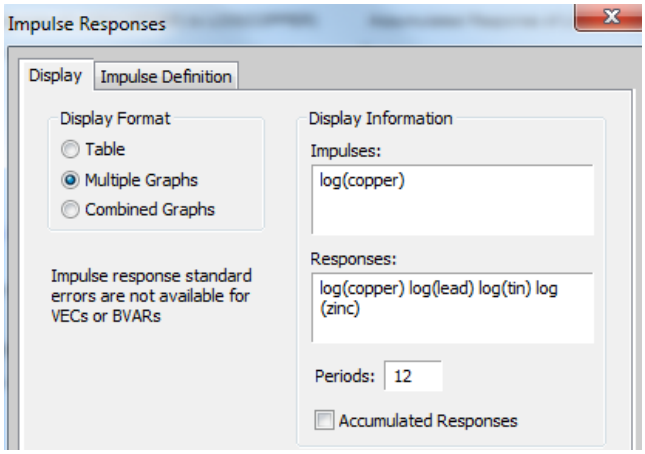


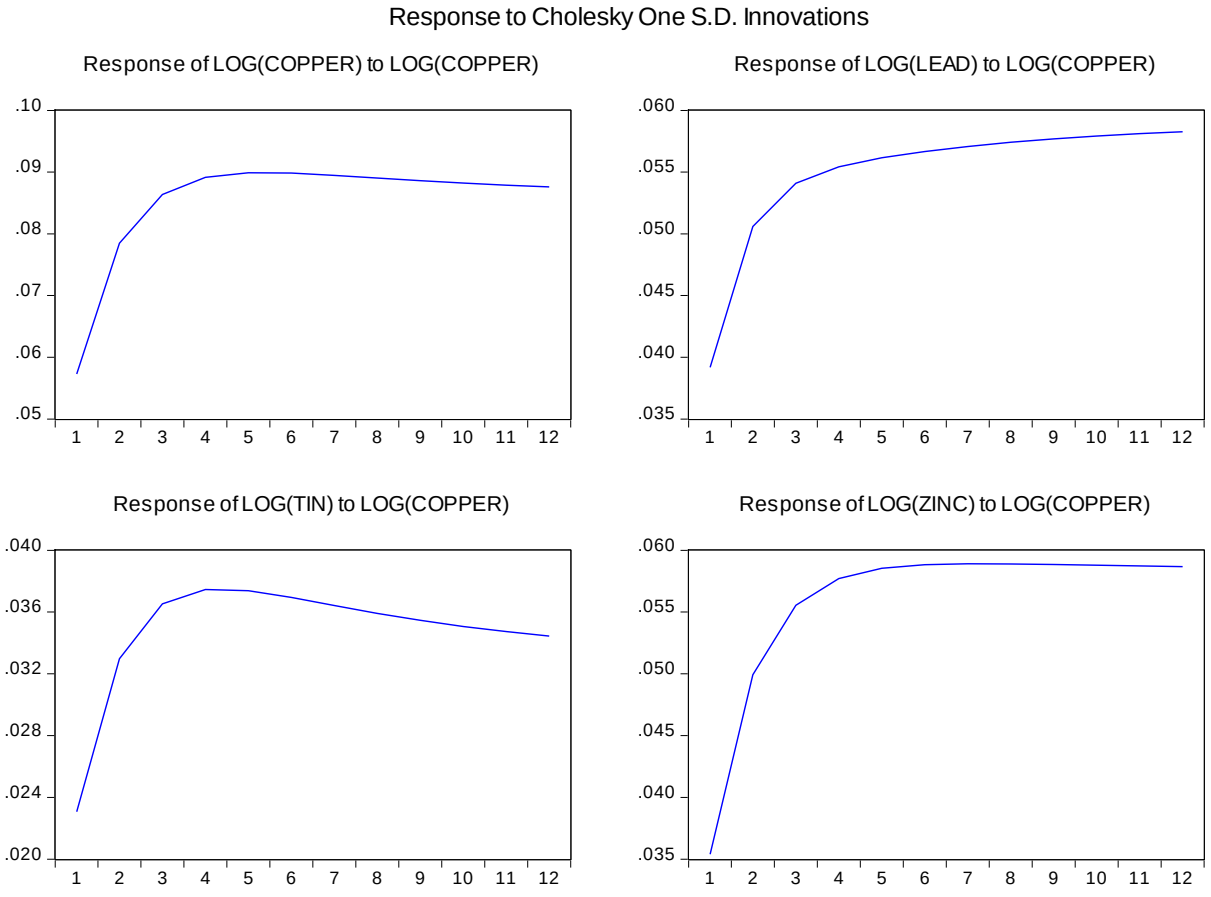
You can test the impact of an "innovation" or "shock" in one of the prices on the long-term impact of the other prices.

This is achieved by analysing the Impulse Responses…



For example. This is the impulse response for an innovation on the copper price. Interpret the result.





Finally, you can test the model's forecasts. In the next figure you find the out-of-sample forecasts for 2019. What can you conclude?

Out of Sample Forecasting