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VAR & COINTEGRATION: Precious Metals

(2) Johansen – Cointegration Test

Date: 02/16/19 Time: 15:43
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

Indicate 1 cointegrating equation at 0.05 level.

(3) Johansen – Cointegration Test

Vector Error Correction Estimates
Date: 02/16/19 Time: 15:51
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]

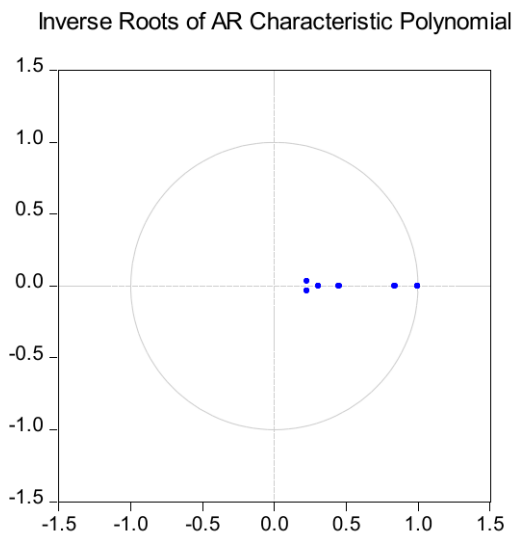
Equation interpretation: ZINC is not significant, thus can be removed from the equation.

1 * LOG(COPPER(-1)) – 2.5 * LOG(TIN(-1)) - 6.9 = 0

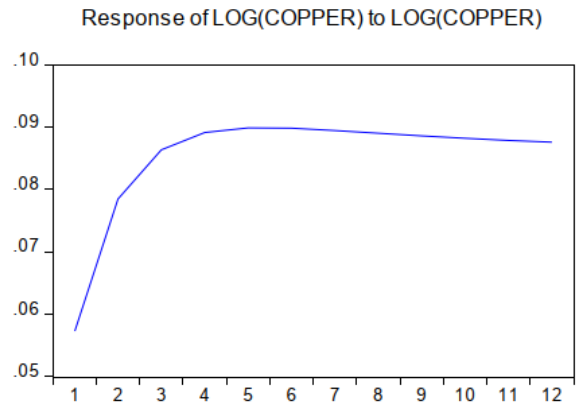
Error Correction:	D(LOG(COP...	D(LOG(LEAD))	D(LOG(TIN))	D(LOG(ZINC))
CointEq1	-0.018218 (0.00820) [-2.22041]	0.013266 (0.00982) [1.35031]	-0.025830 (0.00746) [-3.46049]	-0.004341 (0.00838) [-0.51821]
D(LOG(COPPER(-1)))	0.420624 (0.06844) [6.14621]	0.089441 (0.08195) [1.09147]	0.091521 (0.06226) [1.46997]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

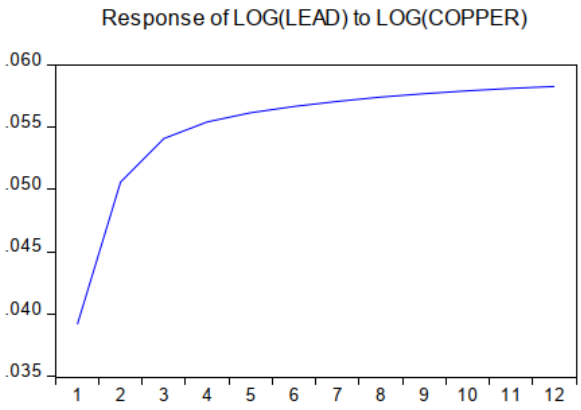
Tin is the main drivers. Lead has significant impact on the long term relationship, but won't be affected by long term relationship, also no impact on other metals.

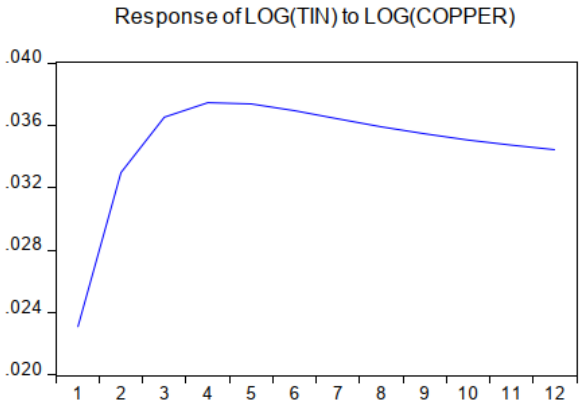
We can improve the model by removing ZINC price from the model.

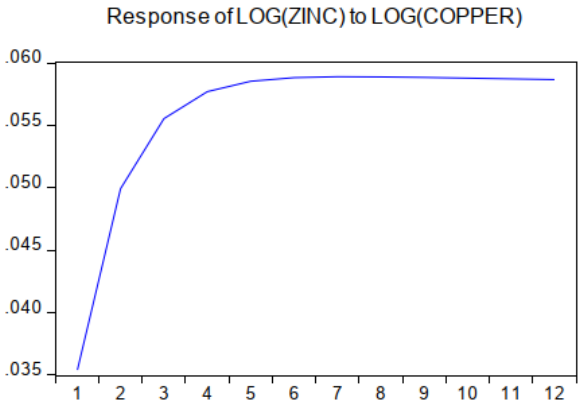


All the AR root lies inside the circle means the model is stationary.







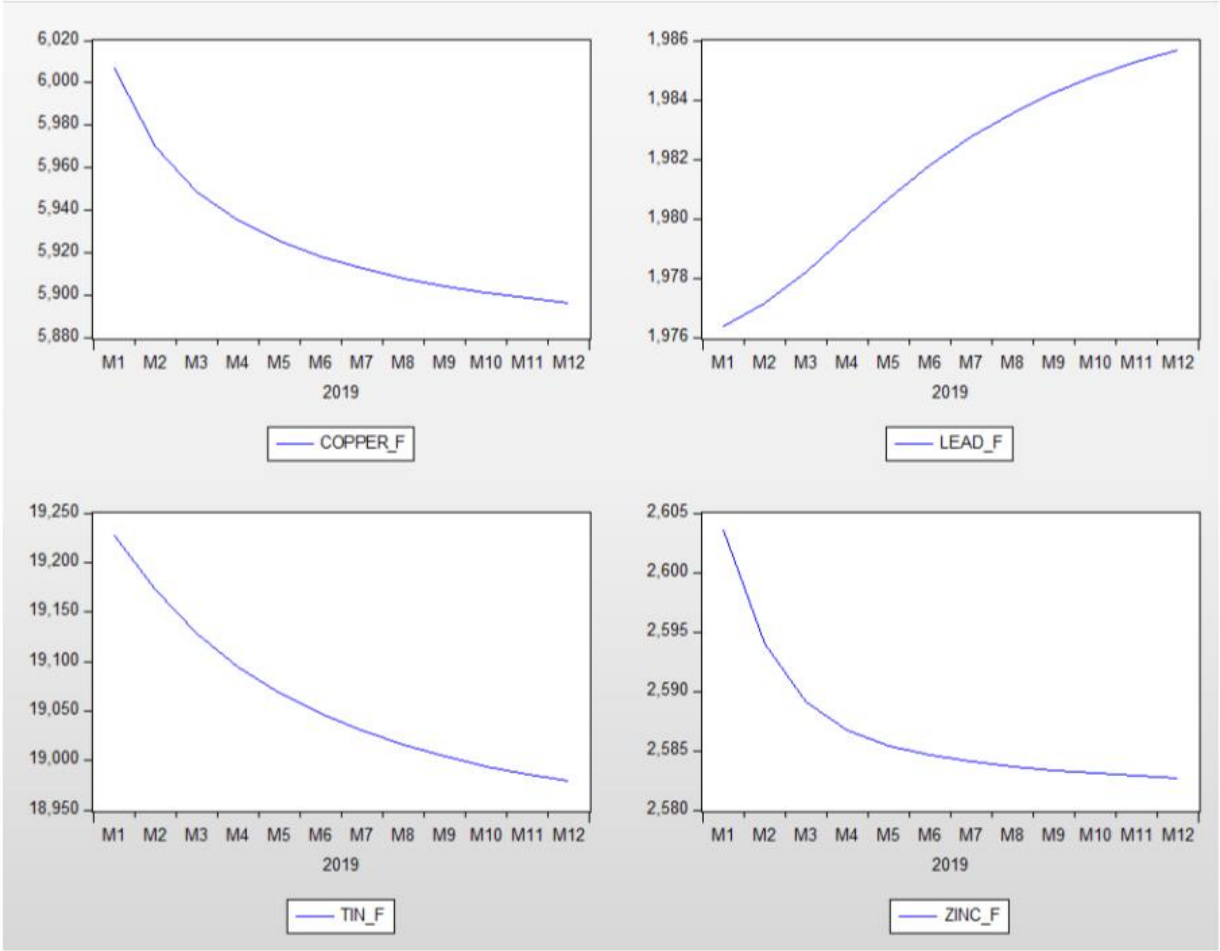


Impulse Responses:

a one-unit Copper Price Shock is expected to lead to a change in Lead Price of 0.06 units after 12 periods.

a one-unit Copper Price Shock is expected to lead to a change in Tin Price of 0.035 units after 12 periods.

a one-unit Copper Price Shock is expected to lead to a change in Zinc Price of 0.06 units after 12 periods.



Copper, Tin and Zinc price will drop over the next 12 month, while Lead price will surge in the following months.