Session 5 - Workshop

Li XueQing (A0186108A) Jiang Xue (A0186734u)
Part 2
2. all non-stationary
3.
Date: 02/16/19 Time: 15:41
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

Conclusion: 1 cointegrating equation at the 5% confidence level
Vector Error Correction Estimates
Date: 02/16/19 Time: 15:48
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 price not significant to copper price, others are significant . we can remove zinc in the model

Log(Copper) = 2.536Log(lead)-1.65log(tin) +6.925

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]
R-squared	0.163207	0.063175	0.112511	0.136039
Adj. R-squared	0.153391	0.052186	0.102100	0.125904
Sum sq. resids	1.119006	1.604394	0.926161	1.166389
S.E. equation	0.057285	0.068593	0.052115	0.058485
F-statistic	16.62706	5.748865	10.80750	13.42340
Log likelihood	501.0290	438.6961	533.7515	493.8543
Akaike AIC	-2.867220	-2.506914	-3.056367	-2.825747
Schwarz SC	-2.811635	-2.451330	-3.000782	-2.770163
Mean dependent	0.002733	0.002682	0.003296	0.001814
S.D. dependent	0.062258	0.070456	0.054999	0.062555

Determinant resid covariance (dof adj.)	3.90E-11
Determinant resid covariance	3.68E-11
Log likelihood	2192.584
Akaike information criterion	-12.52939
Schwarz criterion	-12.25146
Number of coefficients	25

Equation interpretation
F1=-0.0182 (significant)
F2=0.0133 (significant)
F3=-0.0258(significant)
F4=-0.0043 (not significant)
F value shows that zinc not significant in the long term relationship . f2 is the biggest means lead more important in the long term relationship.

Copper price has significant effect on copper price and zinc price. Copper price is only affected by copper.
Lead price has significant effect on lead price only. Lead price is only affected by lead.
Tin price has significant effect on lead, tin pand zinc price. Tin price is only affected by tin.
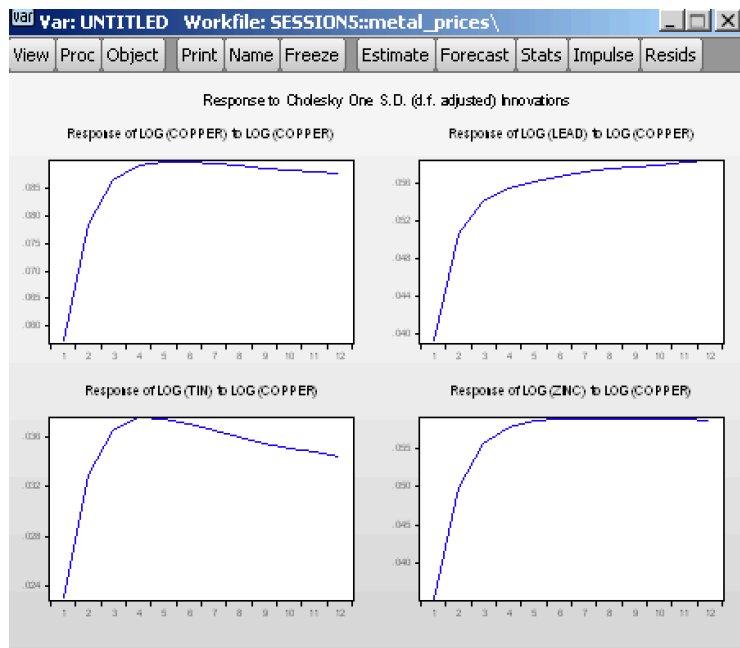Zinc price has significant effect on zinc price only. Zinc price is affected by copper, lead and zinc.

Tin is the main driver, cause it affect lead , tin and zinc prices

How to improve model : remove zinc from the model

Inverse Roots of AR Characteristic Polynom
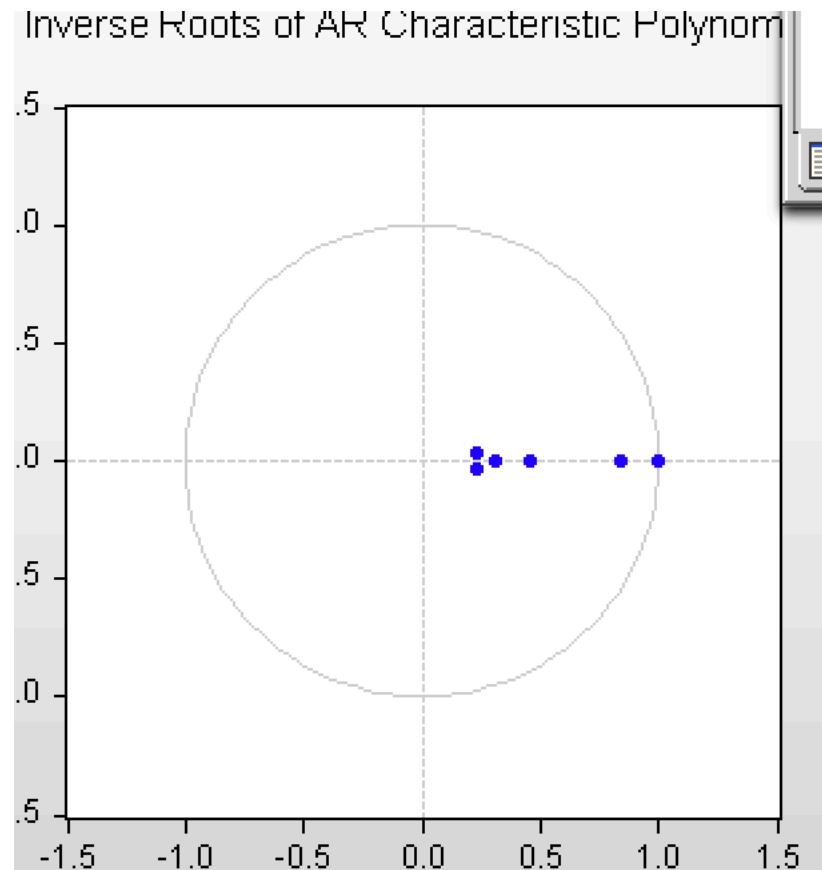
The roots all inside the Z=1 circle, means they are not explosive and non-stationary

Impulse response:

The line is an estimate for the amount Y is expected to change following a unit impulse after the number of periods on the horizontal axis. We take 0.055 Y value as the reference, the result shows that 1 unit impulse change of copper price leads to 0.055 change within 1 period on copper, 2 period on zinc, 4 period of lead, and not applicable to tin. The results match the results we observed previously that copper price significant impact on copper and zinc price

Forecasting :
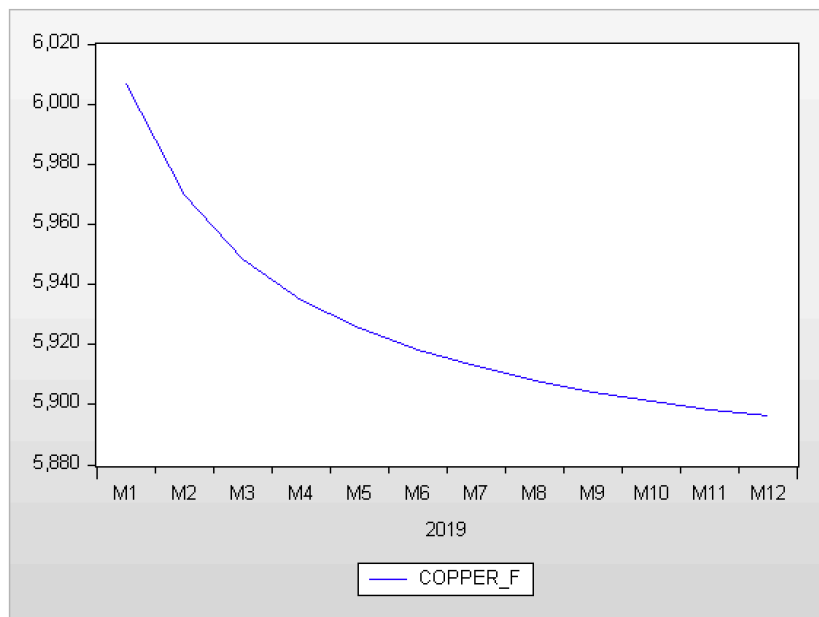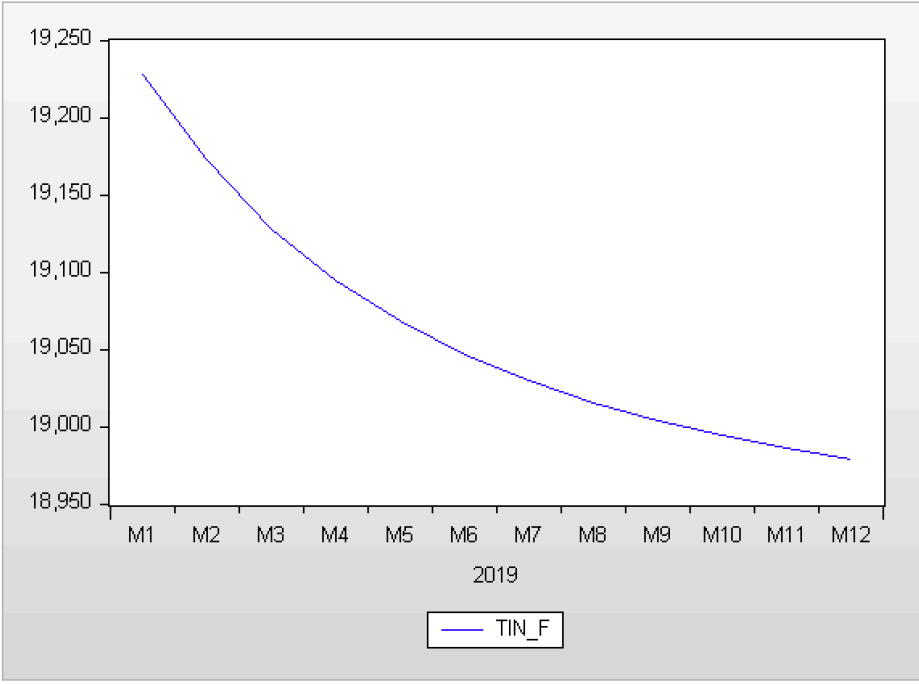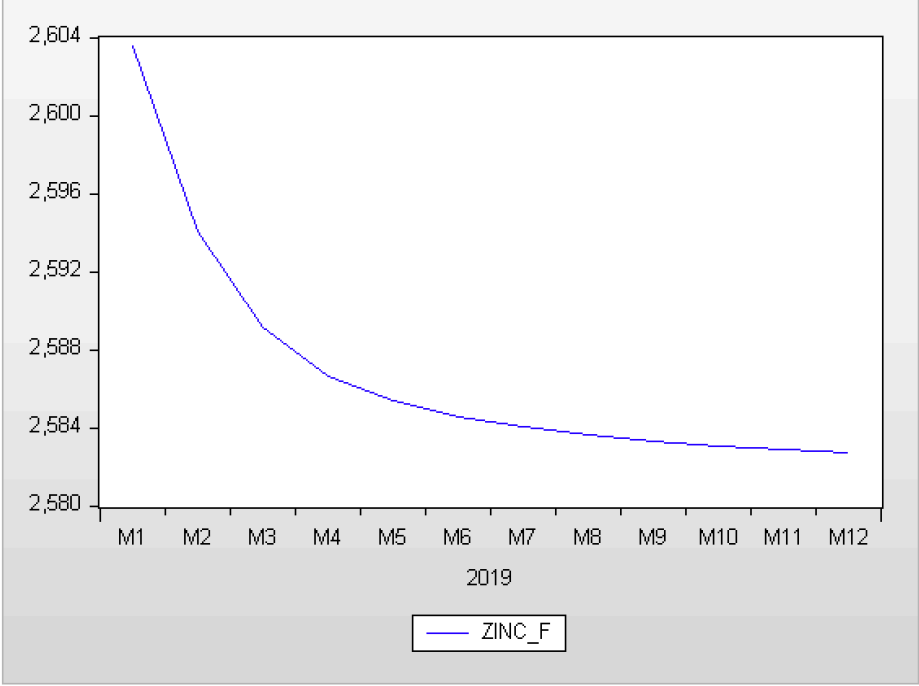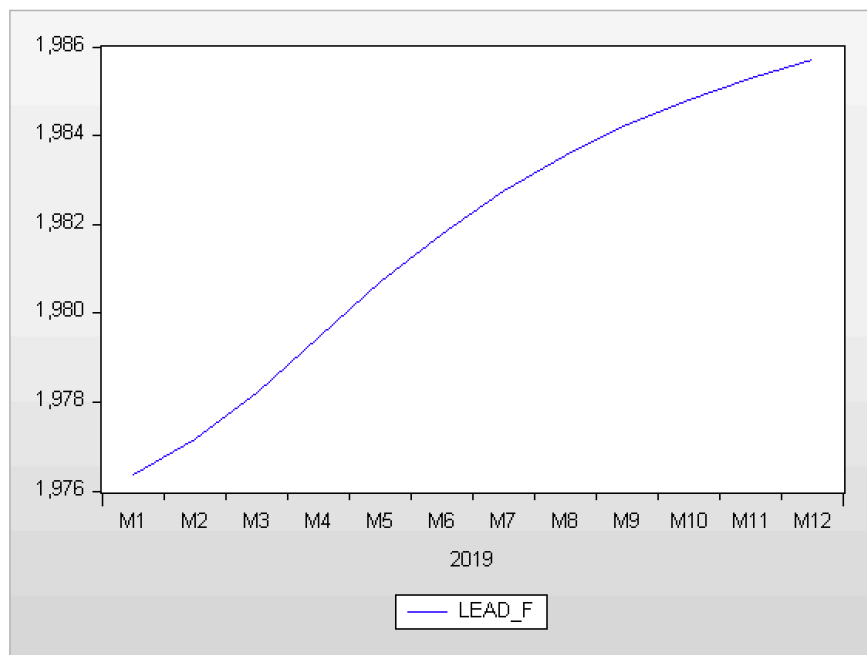
Conclusion : copper price will drop around 120, lead price will increase by around 10 , tin will drop by around 250, zinc will drop around 25 in the next 12 months. The result match the f-value we observe in the equation estimation. F is negative for copper, tin, zinc and positive for lead, which means that in long term, copper, tin zinc will increase to reach the long term trend, and zinc should drop to reach the long term trend .