Solution for the exam "Time Series Analysis" summer term 2004 (second) Prof. Dr. Joachim Grammig

[**Task 1**]

- Most macroeconomic time series exhibit non stationary behavior. Classical simultaneous equation models ignored this fact.
- spurious regression problem
- endogeneity of regressors (simultaneous equation bias)

simultaneous equation bias (estimators are not consistent)

We want to analyze the effect of shocks of the the primitive system (orthogonal shocks). To capture those effects out of the composite shocks we have to impose identifying restrictions.

Granger causality: Do lagged values of X influence the presence or future of Y?.

[**Task 2 a)**]

$$t = \frac{-0.05}{0.03} = -1.67 \qquad \Rightarrow t > t_{crit} = -1.95 \ (\alpha = 0.05)$$

We cannot reject the null hypothesis of non stationarity.

[**Task 2 b)**]

$$t = \frac{-0.3}{0.03} = -10 \qquad \Rightarrow t < t_{crit} = -2.93 \ (\alpha = 0.05)$$

We reject the null hypothesis of non stationarity.

[**Task 2 c)**]

Test all three cases of Dickey Fuller, without drift, with drift, with drift and trend. Look up the critical values in the respective Dickey Fuller table and decide accordingly.

[**Task 2 d)**]

$$p = 0.12 > \alpha \quad \text{for all conventional significance levels}$$

Null hypothesis cannot be rejected

[Task 2 e)]

$$p = 0.001 < \alpha \quad \text{for all conventional significance levels}$$

Null hypothesis can be rejected

[Task 3 a)]

non-stationary AR(2) process

[Task 3 b)]

non-stationary ARMA(2,1) process (Random Walk), MA part is invertible

[Task 3 c)]

stationary MA(1) process (not invertible)

[Task 3 d)]

stationary MA(2) with coefficient of first lag equals 0 (invertible)

[Task 3 e)]

stationary ARMA(2,1) process, MA part is not invertible

[Task 3 e)]

stationary ARMA(2,2) process with coefficient of first MA lag equals 0, MA part is not invertible

[Task 4 a)]

Wrong, one has to use the Johansen method, since the Engle-Granger approach is not feasible if there are multiple cointegrating relationship.

[Task 4 b)]

Wrong, any finite order MA(q) is invertible if the roots of $(1 + \theta_1 L + \theta_2 L^2 + \cdots + \theta_q L^q) = 0$ lie outrside the unit circle.

[Task 4 c)]

Wrong, since the Dickey Fuller test tests for a Random with or without drift or time trend, respectively.

[Task 4 d)]

True.

[Task 4 e)]

Wrong, first you have to test for cointegration between the variables.

[Task 5 a)]

Non-stationary process, maybe with time trend.

[Task 5 b)]

ARMA process with long memory.

[Task 5 c)]

Random Walk!

[Task 5 d)]

(stationary) ARMA process

[Task 5 e)]

White Noise process

[Task 5 f)]

stationary ARMA process

[Task 6]

First, test the series for stationarity. Then, if both series are $I(1)$, test for cointegration. If cointegrated, apply the error correction model. Compare adjustment parameters and conclude. The higher the adjustment parameter, the faster the price adjusts to the equilibrium.