

Seminar 10. Statistical hypothesis and their economical application

Task 1. GDP and Money Supply

Try to consider nonlinear regression models between M1 and GDP on the basis of Ukrainian quarterly data (2002-2014):

$$\log m1_t = \alpha + \frac{\beta}{gdp_t + \gamma} + \varepsilon_t$$

$$\log m1_t = \beta_0 + \beta_1 gdp_t + \beta_2 gdp_t^2 + \beta_3 gdp_t^3 + \varepsilon_t$$

1. Choose the best model that satisfies the most econometric tests.
2. Test it for standard econometric criteria.

Task 2. U.S. Investment Data

File: *macro.txt*

- Year = Date,
- GNP = Nominal GNP,
- Invest = Nominal Investment,
- CPI = Consumer price index,
- Interest = Interest rate.

On the basis of 15 yearly observations (1968-1982) build the best non-linear regression that can satisfy all econometric tests.

Task 3. Purchasing parity

File: *cpi.xls*

Test if there is a purchasing parity between Japan and USA, analyzing the model

$$r_t = \alpha + \beta(p_t - p_t^*) + \varepsilon_t,$$

with

- r – natural logarithm of nominal exchange rate,
- p - natural logarithm of cpi in Japan
- p^* - natural logarithm of cpi in USA.

1. Estimate the model
2. Build the graph of the model, analyse the results
3. Check the model with all possible econometric tests.

Task 4. Philips curve

1. Check if there is a trade-off between inflation and unemployment in Great Britain, using real quarterly data form 2002 till 2014.
2. Test residuals for normality in both cases.
3. Test the model for usual econometric criteria.
4. Build 5 more nonlinear models, which can describe the relation better.

Task 5. GE returns

File: *gereturns.txt*

File consists monthly log returns of GE stock.

1. Try to consider non-linear trend with seasonal component.
2. Consider different growth trends.
3. Test all the econometric criteria.

Task 6. Enterprise output

Table consists statistics regarding 15 enterprises with similar production.

№	Output, mln. UAH, y	Average labour productivity, UAH/hour, x_1	The effectiveness of capital assets, UAH per 1000 UAH., x_2
1	26	37	39
2	33	33	40
3	24	15	35
4	29	36	48
5	42	26	53
6	24	24	42
7	52	15	54
8	56	33	54
9	26	44	50
10	45	34	53
11	27	63	46
12	54	8	50
13	34	44	43
14	48	43	55
15	45	31	51

1. Estimate regression coefficients: $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$.
2. Check the model for significance, $\alpha = 0,1$.
3. Test hypothesis: $H_0 : \beta_2 = 1,4, \alpha = 0,1$.
4. Test hypothesis $H_0 : \beta_1 + \beta_2 = 1, \alpha = 0,1$.
5. Test presence of autocorrelation, $\alpha = 0,01$.
6. Forecast output if average labour productivity reaches $x_1 = 45$ and the effectiveness of capital assets is $x_2 = 59$.
7. Define elasticity coefficients and chose the most important factor.
8. Check model for multicollinearity.