

## Seminar 9. Multiple regression

### Task 1. Population

The dynamics of the USA population is given in the table

Year	Data
1790	3,9
1800	5,3
1810	7,2
1820	9,6
1830	12,9
1840	17,1
1850	23,2
1860	31,4
1870	39,8
1880	50,1
1890	62,9

Year	Data
1900	76,0
1910	91,0
1920	105,7
1930	122,8
1940	131,7
1950	150,7
1960	179,3
1970	203,3
1980	226,3
1990	248,7
2000	281,4

1. Develop an appropriate non-linear trend model.
2. Test model for significance, coefficients stability, heteroscedasticity, autocorrelation, multicollinearity etc.
3. Make forecasts for the next 30 years. Compare forecast for 2010 with real value.
4. Compare forecast with the linear trend model.
5. Test residuals for normality in both cases.
6. Adjust sample for 1790:1970. Repeat steps 1-3. Is the model stable?

### Task 2. Cobb-Douglas function

File: *cobb.xls*

1. Create workfile *cobb.wf1* and import data from *cobb.xls*. Log all variables.
2. Estimate Cobb-Douglas function. Check it for all known econometric tests.
3. Calculate necessary elasticity coefficients. Would you recommend expanding this economy?

### Task 3. Food consumption

File: *chicken.wf1*

Using file define the best model for chicken sales ( $y$ ), using chicken price ( $pc$ ), beef price ( $pb$ ) and disposal income ( $yd$ ). Test your regression for redundant and omitted variables, provide correct functional form for your model. Compare results with Step-wise procedure. Test your regression for all possible tests (level of confidence is 95%):

- Model significance
- Coefficient significance
- Model stability
- Multicollinearity presence
- Heteroscedasticity presence
- Autocorrelation presence

- Redundant variable (pb)
- Omitted variable (pc<sup>2</sup>)

Write down and test the following hypothesis (level of confidence is 95%):

- Chicken and beef are absolute substitutes;
- If people earn in average 100\$ more and chicken price grows on 1\$, the total sales are won't change.

Define the most important factor for the model.

Forecast chicken sales in the next period, if prices on beef and chicken grow on 1\$, disposal income - on 100\$.

#### **Task 4. Macroeconomics**

*File: macromod.wfl*

Formulate economic hypotheses about dependence between GDP (y) and other macroeconomic factors. Estimate the best model for GDP (y). Test your regression for redundant and omitted variables, provide correct functional form for your model. Compare results with Step-wise procedure. Test your regression for all possible tests (level of confidence is 95%):

- Model significance
- Coefficient significance
- Model stability
- Multicollinearity presence
- Heteroscedasticity presence
- Autocorrelation presence

Define the most important factor for the model.