Seminar 3

LRM estimation

Exercises

1. Define matrix **X** and vector **y** for parameters' estimation using OLS method of the model specified in Exercise 5 of Seminar 2. Include intercept term and take no account of multicollinearity. (Model considering multicollinearity occurrence between CP BM and In will be estimated next seminar.)

2. Estimate parameters of this model based on the following data table.

Data table:

Year	UV	C PM (kg/person/ year)	CP PM (CZK/kg)	CP BM (CZK/kg)	CP ChM (CZK/kg)	Income (thousand CZK)
Variable						
1995		8,04	84,20	94,81	52,32	55,578
1996		8,87	90,42	102,12	62,77	64,114
1997		8,74	92,11	104,82	70,64	70,968
1998		10,36	86,39	110,16	73,31	77,942
1999		9,78	80,47	107,80	56,51	80,771
2000		8,94	90,04	111,53	61,83	83,422
2001		9,05	101,66	112,56	71,28	90,167
2002		9,55	89,84	112,99	62,40	93,153
2003		10,14	82,74	108,02	60,67	98,102
2004		9,97	85,36	112,84	62,55	102,217
2005		11,18	85,30	117,73	62,73	116,574
Average		**9,51**	**88,05**	**108,67**	**63,36**	**84,819**

Possible procedure (steps) of parameters' estimation:

1. step: $X^T X$
2. step: $(X^T X)^{-1}$
3. step: $X^T y$
4. step: $(X^T X)^{-1} X^T y$

3. Explain the meaning of parameters and process an economic verification.

4. Verify a statistical significance of parameters and calculate coefficient of determination.

Table for calculation of adjusted residual variance and coefficient of determination

Year	C PM real	C PM teor.	u	u^2	$y_t - \bar{y}$	$(y_t - \bar{y})^2$
1995	8,04					
1996	8,87					
1997	8,74					
1998	10,36					
1999	9,78					
2000	8,94					
2001	9,05					
2002	9,55					
2003	10,14					
2004	9,97					
2005	11,18					

Number of observations =

Degrees of freedom =

Adjusted residual variance ($\overline{S_u^2}$) =

Matrix $(X^T X)^{-1}$ for parameters' verification

UV	CP PM	CP BM	CP ChM	In
106,894340				
	0,005298			
		0,021988		
			0,005787	
				0,002402

Parameters' verification

	UV	CP PM	CP BM	CP ChM	In
S_{ii}					
S_{bi}					
t-value					
t-tab. (α=0,1)					
S / I *					

* S = significant parameter, I = insignificant parameter

5. Find the confidence interval for estimated parameters on the level of significance 5 %.

6. Examine an autocorrelation of residuals. The examination might be completed on the basis of the following Durbin-Watson test (DW):

$$DW = \frac{\sum_{t=2}^{n}\left(u_t - u_{(t-1)}\right)^2}{\sum_{t=1}^{n}u_t^2}.$$

Individual exercises

1. Define matrix **X** and vector **y** for parameters' estimation using OLS method of the model specified in Individual exercise 6 of Seminar 2. Include intercept term.

2. Estimate parameters of this model.

3. Explain meaning of the parameters and process an economic verification.

4. Verify a significance of the parameters and calculate R^2.

5. Examine an autocorrelation of residuals.