Seminar 12

Two-factor production function

Exercises

1. Based on the data table (see extra file with data set), two-factor production function which describes relation among production increase, weight and feed consumption was estimated in the following form:

$$y = a + bx_1 + cx_2 + d(x_1x_2) + ex_1^2 + fx_2^2$$

   y *production increase in t per run*
   x_1 *weight in t per run*
   x_2 *feed consumption in t per run*

Following parameters were estimated using OLSM in Statistica 8.0:

R= 0,92035149 R²= 0,84704686 Upravené R²= 0,82155467 F(5,30)=33,228						
	Parameter	**Std.deviation**	**Parameter**	**Std.deviation**	**t(30)**	**p-value**
Constant			-10,8108	16,53093	-0,65397	0,518111
x_1	0,01043	1,057409	0,0040	0,40819	0,00986	0,992196
x_2	2,22421	1,052280	4,2753	2,02265	2,11370	0,042965
x_1x_2	0,82676	1,634915	0,0087	0,01727	0,50569	0,616769
x_1^2	0,07815	1,324040	0,0001	0,00207	0,05903	0,953322
x_2^2	-2,33946	1,132862	-0,1293	0,06260	-2,06509	0,047650

Production surface

$$y = -10,81 + 0,004x_1 + 4,28x_2 + 0,009(x_1x_2) + 0,0001x_1^2 - 0,13x_2^2$$
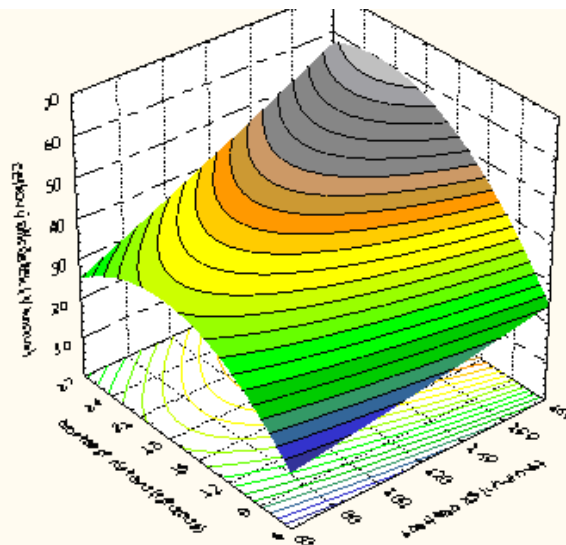
2. Interpret the results of the estimated function – process economic and statistical verification.

3. Calculate average production per run.

4. Explain the contents of the following table and find the combinations of the weight and feed consumption for the similar level of the total increase.

Feed consumption	13	14	15	16	17	18	19	20	21	22	23	24
150	43,311	45,407	47,243	48,822	50,141	51,203	52,005	52,549	52,835	52,862	52,630	52,140
145	42,543	44,595	46,388	47,922	49,198	50,216	50,975	51,475	51,717	51,701	51,425	50,892
140	41,781	43,789	45,538	47,029	48,261	49,235	49,951	50,407	50,606	50,545	50,226	49,649
135	41,025	42,989	44,695	46,142	47,331	48,261	48,932	49,345	49,500	49,396	49,034	48,413
130	40,275	42,195	43,857	45,261	46,406	47,292	47,920	48,290	48,401	48,253	47,847	47,182
125	39,531	41,408	43,026	44,386	45,487	46,330	46,914	47,240	47,307	47,116	46,666	45,958
120	38,793	40,626	42,201	43,517	44,575	45,374	45,915	46,197	46,220	45,985	45,492	44,740
115	38,061	39,851	41,382	42,655	43,669	44,424	44,921	45,159	45,139	44,861	44,323	43,528
110	37,336	39,082	40,569	41,798	42,768	43,480	43,933	44,128	44,064	43,742	43,161	42,322
105	36,616	38,319	39,762	40,948	41,874	42,542	42,952	43,103	42,996	42,630	42,005	41,122
100	35,903	37,562	38,962	40,103	40,986	41,611	41,977	42,084	41,933	41,523	40,855	39,928
95	35,196	36,811	38,167	39,265	40,104	40,685	41,007	41,071	40,876	40,423	39,711	38,741
x_2 / x_1						**Weight**						

5. Deduce average production function for both explanatory variables (AP_{x1}, AP_{x2}) and calculate their average amount. Interpret the results.

6. Derive the procedure of calculation of the point of maximal average production.

7. Deduce marginal production function for both variables (MP_{x1}, MP_{x2}).

8. Calculate production elasticity for average values of the production function.

9. Calculate the combination of x_1 and x_2 for the production function to maximize the production. Then, calculate this level of production.

10. Calculate the amount of factors to maximize the profit, if the prices are following:

$Px_1 = 12\ CZK/kg$
$Px_2 = 68\ CZK/kg$
$Py = 39\ CZK/kg$

Individual exercises

Based on the same data table estimate two-factor production function in the following form:

$$y = a + bx_1 + cx_2 + d(x_1 + x_2) + ex_1^2 + fx_2^2$$

1. Process economic and statistical significance.
2. Deduce average production functions.
3. Deduce marginal production functions.
4. Calculate average amount of production.
5. Calculate average production elasticity and interpret the result.
6. Compare economic and statistical verification of both estimated functions. Decide and explain which function is more suitable for the following analysis.