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变量ΔX3sul存在的三维图分析

ANALYSIS OF 3D GRAPHS OF EXISTENCE OF THE VARIABLE ΔX3SUL

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注解。 本文探讨了计算变量X3并为其构建三维图形的问题。 获得的变量ΔX3sul的值将允许识别变量X3su和X3sl可以存在的极限。
关键词：计算，变量X3su和X3sl，三维图
Annotation. *This article examines the issue of calculating the variable X3 and building 3D graphs for it. The values of the variable ΔX3sul obtained will allow to identify the limits, within which the variables X3su and X3sl can exist.*
Keywords: *calculations, variables X3su and X3sl, 3D graphs*

The author had made the calculations for X3 before, separately for economic shells Vsu and Vsl, which were described in several articles [1, 2]. The discussion below shows how the values of the three variables X1sul, X2sul, X3sul and of the parameter Vsul affect calculations of the variable ΔX3sul and plotting of its 3D graphs. In this case, the values of the variables may remain constant, increase or decrease by a factor of 10. Therefore, an issue of changing ΔX3sul = f(X1sul, X2sul, X3sul, Vsul) is put under examination. Here, the ΔX3sul variable is calculated as the difference between variables X3su and X3sl, i.e. ΔX3sul = X3su – X3sl.

Thus, Figure 1 shows a 3D area ΔX3sul, with the variables having the following values X1sul = X2sul = 1, X3sul = 3..0,65, Vsul = 1..10. As this figure shows, the values of the 3D area diminish by a factor of 4,61 from 2,59 to 0,56. The following figure 2 shows the 3D area ΔX3sul with the variables X1sul = 1, X2sul = Vsul = 1..10, X3sul = 3..64,64, thus increasing by a factor of 21,55.

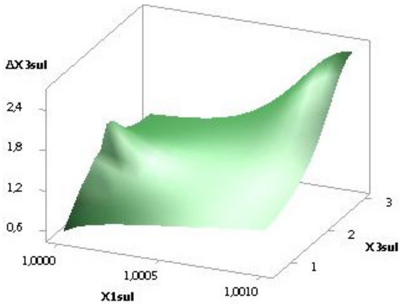

Figure 1.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul=X2sul=1, X3sul=3..0,65,
Vsul=1..10

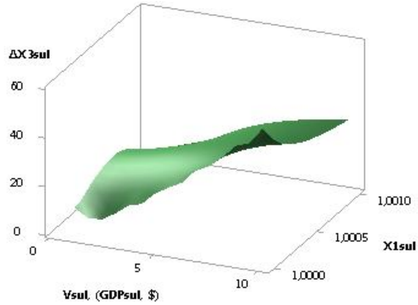

Figure 2.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul=1, X2sul= Vsul =1..10,
X3sul=3..64,64

The following two figures 3 and 4 represent two 3D areas ΔX3sul, with the variables being X1sul = X2sul = Vsul = 1..10, X3sul = 3..646,36 and X1sul = 1..10, X2sul = Vsul = 1, X3sul = 3..30,0 respectively. As seen on the figures, here in two examples the values of the 3D area ΔX3sul increase by factors of 215,45 (Fig. 3) and 10 (Fig. 4).

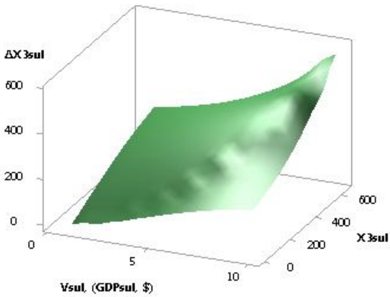

Figure 3.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= X2sul= Vsul =1..10,
X3sul=3..646,36

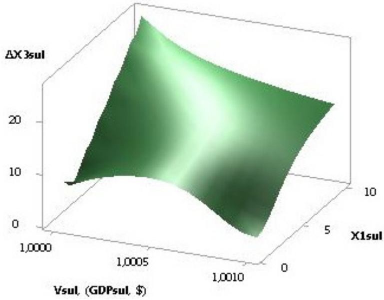

Figure 4.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= 1..10, X2sul=Vsul =1,
X3sul=3..30,0

The values calculated for the 3D area ΔX3sul in figure 5 with the variables X1sul = X2sul = 1..10, X3sul = 3..3000,0 Vsul =1 increase by a factor of 1000. In figure 6 the values of the 3D area ΔX3sul with X1sul = Vsul = 1..10, X2sul = 1, X3sul = 3..6,46 also increase but this time by a factor of 2,15.

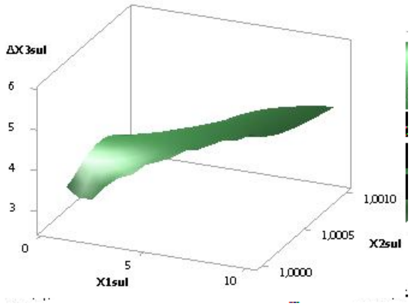

Figure 5.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= X2sul=1..10,
X3sul=3..3000,0 Vsul =1

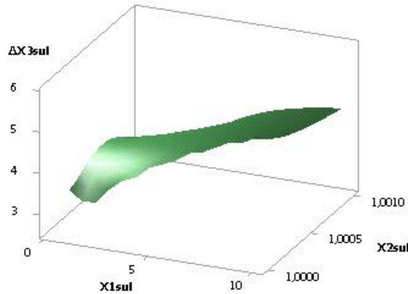

Figure 6.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= Vsul =1..10, X2sul= 1,
X3sul = 3..6,46

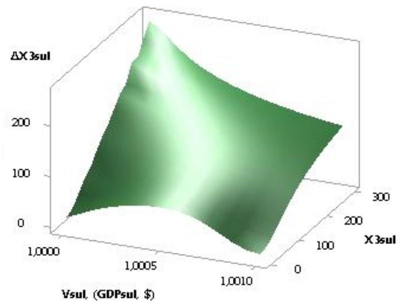

Figure 7.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= Vsul
=1,X2sul=1..10,X3sul=3..300,01

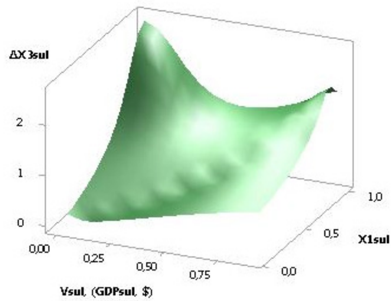

Figure 8.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= X2sul= Vsul =1..0,1,
X3sul = 3..0,01

Figures 7 and 8 were built with X1sul = Vsul = 1, X2sul = 1..10, X3sul = 3..300.01 and X=V =0.1 respectively. Here on the figure 7 the values of the 3D area increase by a factor of 100, while on the figure 8 decrease by a factor of 319.59.

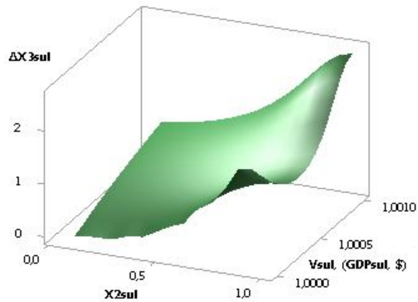

Figure 9.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= X2sul= 1..0,1, Vsul =1,
X3sul = 3..0,003

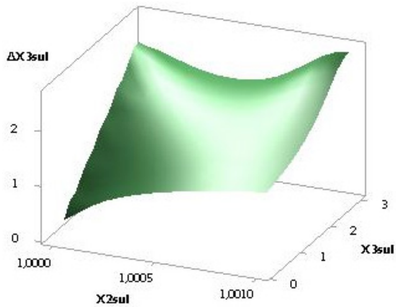

Figure 10.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= 1..0,1, X2sul= Vsul =1,
X3sul = 3..0,3

The next two figures 9 and 10 show 3D areas with 1sul = X2sul = 1..0,1, Vsul = 1, X3sul = 3..0,003 and X1sul = 1..0,1, X2sul = Vsul = 1, X3sul = 3..0,3 respectively. On this figure 9 the 3D area increases by a factor of 1000, and on the figure 10 by a factor of 10. Figures 11 and 12 show that the dependencies built of the 3D area with X1sul = X2sul = 1, Vsul = 0,1..1, X3sul = 3..0,1 and X1sul = 1, X2sul = Vsul = 1..0,1, X3sul = 3..0,14 increase by a factor of 4,64 (Fig. 11) and decrease by a factor of 21,41 (Fig. 12).

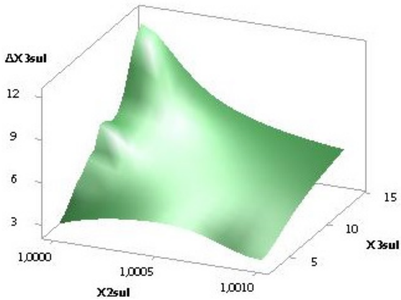

Figure 11.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= X2sul=1, Vsul =0,1..1, X3sul
= 3..0,1

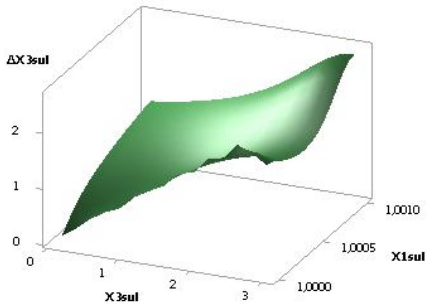

Figure 12.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul=1, X2sul= Vsul =1..0,1,
X3sul = 3..0,14

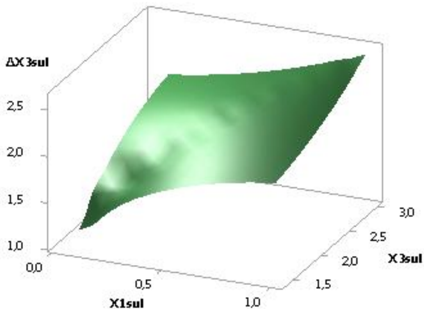

Figure 13.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= Vsul =0,1..1, X2sul=1,
X3sul = 3..1,39

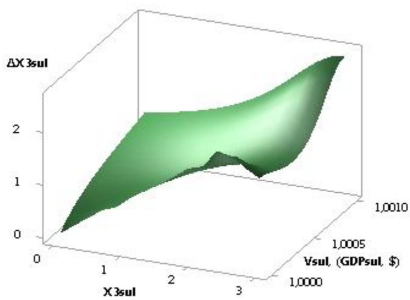

Figure 14.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul =1, X2sul = Vsul = 1..0,1,
X3sul= 3..0,03

On the figure 13, the 3D area ΔX3sul with X1sul = Vsul = 0,1..1, X2sul = 1, X3sul = 3..1,39 decreases by a factor of 2,16. Figure 14 shows that the 3D surface ΔX3sul with variables X1sul = 1, X2sul = Vsul = 1..0,1, X3sul = 3..0,03 decreases by a factor of 100.

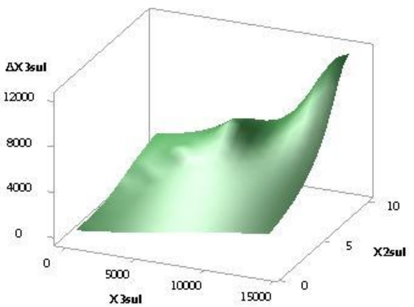

Figure 15.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= X2sul= 1..10, Vsul=1..0,1
X3sul= 3..13925,38

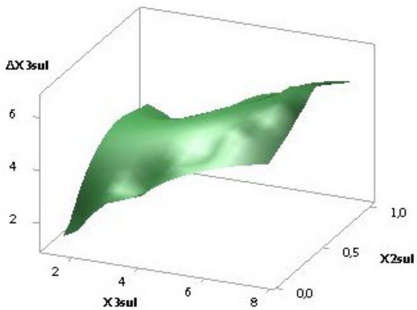

Figure 16.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= 1..10,
X2sul= Vsul= 1..0,1,
X3sul= 3..7,59

The figure 15 shows the 3D surface ΔX3sul with X1sul = X2sul = 1..10, Vsul = 1..0,1 X3sul = 3..13925,38 increasing by a factor of 4641,86. The 3D surface ΔX3sul, depicted in figure 16, apparently has its maximum 7,59 in the point 5. This 3D surface was plotted with variables X1sul = 1..10, X2sul = Vsul = 1..0,1, X3sul = 3..7,59.

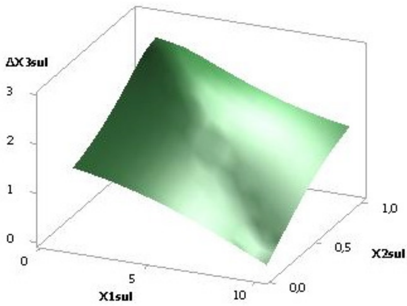

Figure 17.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= Vsul= 1..10, X2sul= 1..0,1,
X3sul= 3..3,06

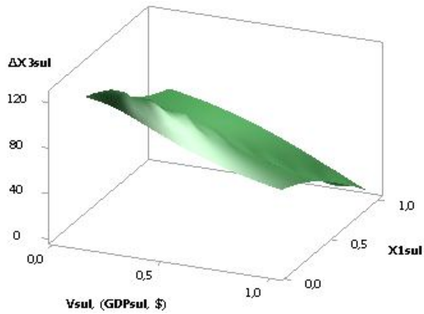

Figure 18.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= Vsul=1..0,1, X2sul= 1..10,
X3sul= 3..142,11

The next figure 17 was plotted with variables X1sul = Vsul = 1..10, X2sul = 1..0,1, X3sul = 3..3,06. Here, the 3D surface ΔX3sul also has its maximum 2,65 in the point 2. The following variables X1sul = Vsul =1..0,1, X2sul = 1..10, X3sul = 3..142,11 were used for plotting the figure 18. The 3D surface obtained has the maximum of 122,91.

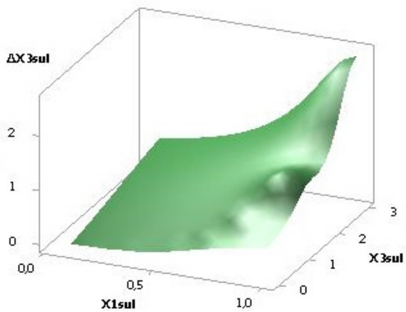

Figure 19.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= X2sul= 1..0,1, X3sul=
3..0,001,
Vsul= 1..10

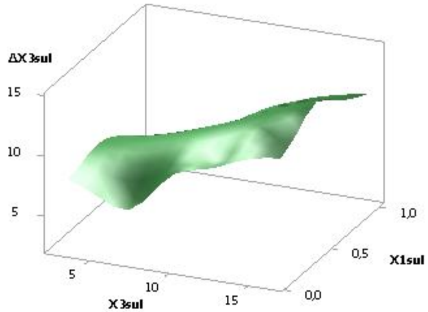

Figure 20.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= 1..0,1, X2sul=Vsul= 1..10,
X3sul= 3..16,35

Figure 19 shows the 3D surface with X1sul = X2sul = 1..0,1, X3sul = 3..0,001, Vsul = 1..10, diminishing by a factor of 2842,95. The 3D surface on the figure 20 with variables X1sul = 1..0,1, X2sul = Vsul = 1..10, X3sul = 3..16,35 has its maximum of 14,14 in the point 6.

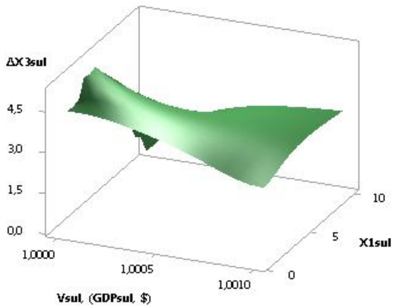

Figure 21.
ΔX3sul = f(X1sul, X2sul,X3su,Vsul)
when X1sul=1..10, X2sul=1..0,1,
X3sul= 3..5,88, Vsul= 1

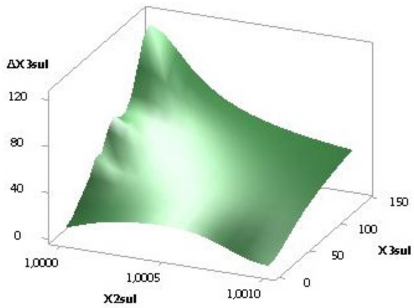

Figure 22.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul=1..10,X2sul=1,
X3sul=3..139,25, Vsul=1..0,1

The 3D surface built on the figure 21 also has its maximum of 5,09 in the point 4 with variables X1sul = 1..10, X2sul = 1..0,1, X3sul = 3..5,88, Vsul = 1. The 3D surface shown in figure 22 increases by a factor of 46,42 with X1sul = 1..10, X2sul = 1, X3sul = 3..139,25, Vsul = 1..0,1.

Figure 23 shows the 3D surface also increasing by a factor of 464,18. This 3D surface was plotted with variables X1sul = 1, X2sul = 1..10, X3sul = 3..1392,54, Vsul = 1..0,1. As seen on the figure 24, the 3D surface built with variables X1sul = 1, X2sul = 1..10, X3sul = 3..0,01, Vsul = 1..0,1 decreases by a factor of 284,29.

Figure 25 shows the 3D surface with X1sul = 1..0,1, X2sul = 1..10, X3sul =3..58,8, Vsul = 1 having its maximum of 50,86 in the point 7. On the last figure 26 there is a 3D surface decreasing by a factor of 50,61 with X1sul = 0,1..1, X2sul = 1, X3sul = 3..0,06, Vsul = 1..10.

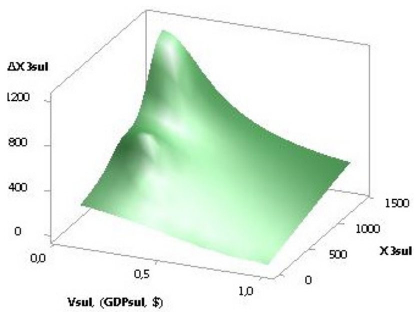

Figure 23.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul=1, X2sul=1..10,
X3sul=3..1392,54, Vsul= 1..0,1

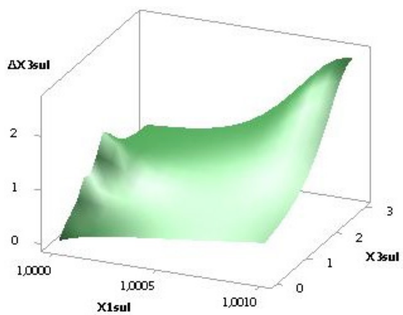

Figure 24.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul=1,X2sul=1..10,X3sul=3..0,01,
Vsul=1..0,1

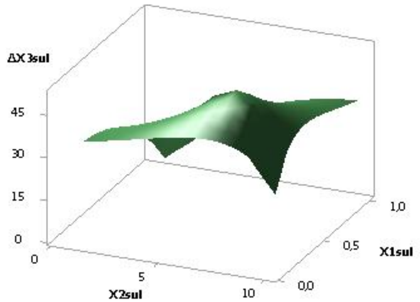

Figure 25.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul=1..0,1,X2sul= 1..10,
X3sul=3..58,8, Vsul= 1

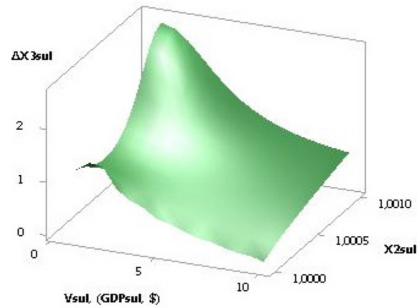

Figure 26.
ΔX3sul = f(X1sul,X2sul,X3su,Vsul)
when X1sul= 0,1..1, X2sul=1,
X3sul=3..0,06, Vsul =1..10

The calculations of ΔX3sul and the values of the variables are given in the combined table 1, where the parameter of the relations of the final value of $ΔX3_{sulf}$ to the initial $ΔX3_{sulb}$ are sorted by a degree of diminution. This allows us to pick maximum or minimum values of the X3 variable, if necessary.

***Table 1.** Sorting the relations of $ΔX3_{sulf}$ / $ΔX3_{sulb}$ by a degree of diminution*

No. in sequence	**$X1_{sul}$, unit**	**$X2_{sul}$, unit**	**$X3_{sul}$, unit**	**V_{sulf}…V_{sulb}, unit.^{3} (GDP_{sulf}…GDP_{sulb}, $)**	**ΔX3sulf…ΔX3sulb, unit**	**ΔX3sulf / ΔX3sulb**
1.	1…10	1…10	3…13925,38	1…0,1	2,59…12044,18	4641,83
2.	1…10	1…10	3…3000	1	2,59…2594,71	1000,00
3.	1	7…10	3…1392,54	0,4…0,1	2,59…1204,42	*464,18*
4.	1…10	1…10	3…646,36	1…10	2,59…559,04	215,45
5.	1	1…10	3…300,01	1	2,59…259,48	100,00
6.	1…0,2	1…9	3…142,11	1…0,2	2,59…122,91	*47,37*
7.	1…10	1	3…139,25	1…0,1	2,59…120,44	*46,42*
8.	1	1…10	3…64,64	1…10	2,59…55,91	21,55
9.	1…0,1	1…10	3…58,8	1	2,59…50,86	*19,60*
10.	1…10	1	3…30	1	2,59…25,95	10,00
11.	1…0,5	1…6	3…16,35	1…6	2,59…14,14	5,45
12.	1	1	3…13,93	1…0,1	2,59…12,05	4,64

No. in sequence	$X1_{sul}$, unit	$X2_{sul}$, unit	$X3_{sul}$, unit	$V_{sulf}…V_{sulb}$, unit.^{3} ($GDP_{sulf}…GDP_{sulb}$, $)	ΔX3sulf…ΔX3sulb, unit	ΔX3sulf / ΔX3sulb
13.	1…10	1…0,1	3…7,59	1…0,1	2,59…6,56	2,53
14.	1…10	1	3…6,46	1…10	2,59…5,59	2,15
15.	1…4	1…0,7	3…5,88	1	2,59…5,09	*1,96*
16.	1…2	1…0,9	3…3,06	1…2	2,59…2,65	*1,02*
17.	1	1	3…3	1	2,59…2,59	1,00
18.	0,2…0,1	9…10	142,11…139,25	0,2…0,1	122,91…120,44	*0,98*
19.	1…0,1	1…10	58,80…3	1	50,86…25,95	*0,51*
20.	1…0,1	1	3…1,39	1…0,1	2,59…1,2	0,46
21.	0,5…0,1	6…10	16,35…6,46	6…10	14,14…5,59	*0,40*
22.	1	1	3…0,65	1…10	2,59…0,56	0,22
23.	1…10	1…0,1	7,59…1,39	1…0,1	6,56…1,2	0,18
24.	1…0,1	1	3…0,30	1	2,59…0,26	0,10
25.	1	1…0,1	3…0,14	1…0,1	2,59…0,12	0,05
26.	4…10	0,7…0,1	5,88…0,3	1	5,09…0,26	*0,05*
27.	2…10	0,9…0,1	3,06…0,06	2…10	2,65…0,05	*0,02*
28.	1…0,1	1…10	3…0,06	1…10	2,59…0,05	*0,02*
29.	1	1…0,1	3…0,03	1	2,59…0,03	0,01
30.	1	0,7…0,1	3…0,01	4…10	2,59…0,01	0,004
31.	1…0,1	1…0,1	3…0,01	1…0,1	2,59…0,01	0,003
32.	1…0,1	1…0,1	3…0,003	1	2,59…0,003	0,001
33.	*1…0,1*	*1…0,1*	*3…0,001*	*1…10*	*2,59…0,001*	*0,0004*

Now we transform Table 1 to Table 2 aiming to group the values of relations of variables $\Delta X3_{sulf} / \Delta X3_{sulb}$ depending on the number of variables used. This table will allow us to pick a value $\Delta X3_{sulf} / \Delta X3_{sulb}$ we need due to alternating variables and the parameter V_{sul}, and it shows us within which limits can the variable $\Delta X3_{sul}$ exist.

Table 2. *Statistics of variables for $\Delta X3_{sulf}$ / $\Delta X3_{sulb}$ by a degree of diminution by group*

No. in sequence	$X1_{sul}$, unit	$X2_{sul}$, unit	$X3_{sul}$, unit	V_{sulf}…V_{sulb}, unit^3 (GDP_{sulf}…GDP_{sulb}, $)	ΔX3sulf…ΔX3sulb, unit	ΔX3sulf / ΔX3sulb
2 variables						
1.	1	1…10	3…300,01	1	2,59…259,48	100,00
2.	1…10	1	3…30	1	2,59…25,95	10,00
3.	1…0,5	1…6	3…16,35	1…6	2,59…14,14	5,45
4.	1	1	3…13,93	1…0,1	2,59…12,05	4,64
5.	0,5…0,1	6…10	16,35…6,46	6…10	14,14…5,59	0,40
6.	1	1	3…0,65	1…10	2,59…0,56	0,22
7.	1…0,1	1	3…0,3	1	2,59…0,26	0,10
8.	1	1…0,1	3…0,03	1	2,59…0,03	0,01
3 variables						
9.	1…10	1…10	3…3000	1	2,59…2594,71	1000,00
10.	1	7…10	3…1392,54	0,4…0,1	2,59…1204,42	464,18
11.	1…10	1	3…139,25	1…0,1	2,59…120,44	46,42
12.	1	1…10	3…64,64	1…10	2,59…55,91	21,55
13.	1…0,1	1…10	3…58,80	1	2,59…50,86	19,6
14.	1…10	1	3…6,46	1…10	2,59…5,59	2,15
15.	1…4	1…0,7	3…5,88	1	2,59…5,09	1,96
16.	1…0,1	1…10	58,80…30	1	50,86…25,95	0,51
17.	1…0,1	1	3…1,39	1…0,1	2,59…1,2	0,46
18.	1	1…0,1	3…0,14	1…0,1	2,59…0,12	0,05
19.	4…10	0,7…0,1	5,88…0,3	1	5,09…0,26	0,05
20.	1	0,7…0,1	3…0,01	4…10	2,59…0,01	0,004
21.	1…0,1	1…0,1	3…0,003	1	2,59…0,003	0,001
all the variables						
22.	1…10	1…10	3…13925,38	1…0,1	2,59…12044,18	4641,83
23.	1…10	1…10	3…646,36	1…10	2,59…559,04	215,45
24.	1…0,2	1…9	3…142,11	1…0,2	2,59…122,91	47,37
25.	1…10	1…0,1	3…7,59	1…0,1	2,59…6,56	2,53
26.	1…2	1…0,9	3…3,06	1…2	2,59…2,65	1,02
27.	0,2…0,1	9…10	142,11…139,25	0,2…0,1	122,91…120,44	0,98

No. in sequence	X1$_{sul}$, unit	X2$_{sul}$, unit	X3$_{sul}$, unit	V_{sulf}…V_{sulb}, unit^3 (GDP_{sulf}…GDP_{sulb}, $)	ΔX3sulf …ΔX3sulb, unit	ΔX3sulf / ΔX3sulb
28.	1…10	1…0,1	7,59…1,39	1…0,1	6,56…1,2	0,18
29.	1…10	1…0,1	3,06…0,06	1…10	2,65…-0,05	0,02
30.	1…0,1	1…10	3…0,06	1…10	2,59…0,05	0,02
31.	1…0,1	1…0,1	3…0,01	1…0,1	2,59…0,01	0,003
32.	1…0,1	1…0,1	3…0,001	1…10	2,59…0,001	0,0004

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