The Work Sample Verification and the Calculation of the Statistical, Mathematical and Economical Probability for the Risks of the Direct Procurement

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Abstract

Each organization has among its multiple secondary endpoints subordinated to a central objective that one of avoiding the contingencies. The direct procurement is carried out on the market in SEAP (Electronic System of Public Procurement), and a performing management in a public institution has as sub-base and risk management. The risks may be investigated by econometric simulation, which is calculated by the use of calculus of probability and the sample for determining the relevance of these probabilities.

Key words: direct procurement, probabilities, sample, deviation.
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1. Choosing and checking the sample

As a result of carrying out an audit that aimed exactly at the direct procurement, approximately 387 identification and analysis sheets (FIAP) were taken into consideration. 100 sheets were randomly selected, extracting all of the fourth sheet. It should be noted that as the FIAPs are placed in a chronological order of their occurrence in time, the reference is made to an initial condition of statistics, namely the random choice.

To verify the representativeness of the sample the following data are required (ideally): the average sample, the overall community average, the standard deviation of the general community. In statistical practice, the overall community average and its standard deviation are typically taken from previous research or provided in the papers and data collection institutions subordinated to the national authority in charge of statistics. In the study, there is no preliminary investigation and any precalculated value. In other words, one needs to resort to the method of verifying the representativeness of the sample in case the standard deviation of the general population is not known. Therefore, in this case the modified "t test" is applied, the model for calculating the value (t_c) being the following:

$$t_c = \frac{\bar{x} - m}{S/\sqrt{n}}, \text{ where:}$$

$\bar{x}$: the average sample;

m : the overall community average;
S : the standard deviation of the sample;
n : the number of individual observations.

For the "m" value of the overall community average a simple average is to be determined, by dividing the total cost of the products traded in SEAP, during a period (year 2016, the first semester), to the total number of FIAPs prepared for their trading:

$$m = \frac{411477,75}{387} lei = 1063,25 lei$$

Table no. 1 presents the data organised for calculating the average $\bar{x}$ of the cost/product and its r-squared deviation.

The average sample for total product cost is:

$$x = \frac{\sum x_i f_i}{\sum f_i} = \frac{87250}{81} = 1077,16 lei$$

Table no. 1 The calculation of the average and the standard deviation of the sample

Nr. crt.	**Groups of total product cost (lei)**	x_i	f_i	$x_i f_i$	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	$(x_i - \bar{x})^2 f_i$
1.	0 – 500	250	29	7.250,00	-827,16	684.194,48	19.841.639,99
2.	500 – 1000	750	13	9.750,00	-327,16	107.033,99	1.391.441,85
3.	100 – 1500	1250	16	20.000,00	172,84	29.873,49	477.975,92
4.	1500 – 2000	1750	13	22.750,00	672,84	452.713,00	5.885.269,01
5.	2000 – 2500	2250	5	11.250,00	1.172,84	1.375.552,51	6.877.762,54
6.	2500 – 3000	2750	3	8.250,00	1.672,84	2.798.392,01	8.395.176,04
7.	above 3000	4000	2	8.000,00	2.922,84	8.542.990,78	17.085.981,56
TOTAL			**81**	**87.250,00**			**59.955.246,91**

Source: own design and processing

Note: As one of the two values which belongs to the last group exceeds 5.000 lei, the group average was set at 4.000 lei, for a correct calculation of the sample average. With these data:

$$S = \sqrt{\frac{59.955.246,73}{81}} = 860,34 lei$$

$$t_c = \frac{1077,16 - 1063,25}{\frac{860,34}{\sqrt{81}}} = \frac{9x13,91}{860,34} = 0,1455$$

In this case, the null hypothesis means that there is a significant difference between the sample average and the overall community average which includes the sample. This means that the sample is not representative of the average, so its average cannot be used with full guarantees of validity in subsequent calculations.

For an established probability of 95% (the significance level of 5%), the table value of the t argument is 1.96 ($t_{zab} = 1{,}96$). As: $t_c = 0{,}1455 < 1{,}96 = t_{zab}$ it appears that the null hypothesis is rejected, so the sample FIAP sites investigated is representative, it means that all data and indicators resulting from the processing of the sample data are representative for the collectivity and the studied economic phenomena.

2. The probability calculation

After there presentativeness of the chosen sample is checked for calculations of probabilities, the data from the 100 FIAPs will be reorganized and centralized so as to clarify exactly what causes risks, along with the consequences of their materialisation. Thus, the data will be centralized by: the total product cost, total other expenses, total value (total product cost + total other expenses) the cause of the deficiency with the FIAP, the consequence. The following causes of risk were identified after centralizing:

a) burning inaccurate data in the report of necessity;

b) the unreal stocks listed in SEAP;

c) the relatively low price of the product, doubled by a lower value application;

d) the stipulation of buying a minimum quantity required by the purchase.

Since the two cases in point c) overlap from an economic point of view, but are independent from the point of view of logic, they could be drawn into two distinct causes, at least in terms of the economic consequences (in all cases from the FIAPs, the risk consists of the transportation costs which is paid by the public institution). In terms of the calculation of the frequency of such cases that will become the probabilities, this division is impossible. In the interests of consistency and scientific logic, it was decided that the two cases should be treated as a unit.

Two types of probabilities will be defined in the following:

a) the statistical and mathematical probability is the ratio (relative frequency, specific gravity) of the number of occurrences of a cause of economic risk and the total number of events observed:

$$P_{sm_i} = \frac{N_{a_i}}{N_t}\ ; \qquad P_{sm}(\%) = \frac{N_{a_i}}{N_t}100\ (\%), \text{ where:}$$

P_{sm} : the statistical and mathematical probability of occurrence of the causes of risk;

N_{a_i} : the total number of occurrences of type "i";

N_t : the total number of the observed events.

b) the economic statistical probability is the number resulting from the total sum of the economic consequences of the events that have the same cuse, to the economic consequences of the materialisation of risks (total other expenses):

$$P_{se_i} = \frac{V_e}{V_t}; \qquad P_{se}(\%) = \frac{V_{e_i}}{V_t}100\ (\%), \text{ where:}$$

P_{se} : the economic statistical probability;

V_{e_i} : the value of the economic risk materialization type "i";

V_t : the total value of the materialisation of risks.

We can see that: $N_t = 81$; and $V_t = 4172{,}96 lei$

The results of the two types of probabilities are summarized in the table no. 2:

Table no. 2 The determination of probability of occurrence and the effect of risk

Nr. crt.	Definition of risk	Symbol	N_{a_i}	P_{sm_i}	V_{e_i}	P_{se_i}
1.	Burning inaccurate data in the report of necessity	R_1	10	0,123	738,81	0,177
2.	The unreal stocks displayed in SEAP	R_2	32	0,395	1638,59	0,393
3.	The relatively low price of the product, doubled by a lower value application	R_3	15	0,185	919,00	0,220
4.	The stipulation of buying a minimum quantity required by the purchase	R_4	24	0,297	876,56	0,210
TOTAL			81	1,000	4172,96	1,000

Source: own design and processing

It can be seen that both probabilities, as they were defined and calculated, are related to risks in the process of the public procurement market in the SEAP, only different in nature and content. Thus, the statistical and mathematical probability represents a probability of occurrence and the manifestation of a certain risk category, while the economic statistical probability represents the probability of materializing in additional expenses the occurrence of that risk. In other words, materialization can not occur without occurence and manifestation; the second probability is the result of the first (the correspondence between them not being two-way), not only undetermining it to some extent, but also having an effect on its level, randomly. Hence, to conclude that the second probability is a stochastic function in relation to the first, there is only one step.

3. Conclusions

By calculating the statistical and mathematical probability occurrence as well as the statistical and economic probability related to the materialization of the risk, it can be stated that in terms of public direct procurement, these can be done with some security because the risks can be predicted, and any economic consequences that may result emerging risks may be set out and measured. Another conclusion is that events in the public procurement process form a convex, compact and dense manifold which abide by the natural laws of statistics.

4. References

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