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COMPETITIVE POSITION OF COMPANIES IN THE CONSTRUCTION SECTOR QUOTED ON THE WARSAW STOCK EXCHANGE IN WARSAW

Abstract

The aim of the present paper is to arrange companies in the construction sector quoted on the Warsaw Stock Exchange from the best to the worst, so to create a kind of a ranking of these companies and indicate a model of development among these.

A complex measure, on the basis of which the arrangement of companies was done, is a competitive position of an enterprise determined by means of the following three variables:

- net profits from sale,
- average annual rate of changes in net profits from sale,
- the rate of return on assets.

These variables describe a competitive position of firms under examination in an undoubtedly significant way. Net profits from sale determine a share of a particular firm in the market. Average annual rate of changes in profits shows a dynamics of the increase in net profits from the sale of products, materials, and goods, thus describes whether a company successively increases or reduces its share in the market. On the other hand, the rate of return on assets enables to evaluate whether an enterprise takes rational actions influencing the development of sale, or whether it increases its profits decreasing, in this way, the level of profitability.

The analysis involved twenty five companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw in October 2006. In the case of profits from sale and the rate of return on assets, data from 2005 were analyzed, and in the case of average annual rate of changes in net profits from sale, data from the years 2001-2005. Methods of multidimensional comparative analysis (MCA; Polish abbreviation WAP) were used, and particularly a method of standardized sums which had been preceded by variables normalization (standardization).

Key words: Competitive Position of Enterprises, Economic Development (O1)

Introduction – the methodology of the research

Multidimensional comparative analysis (short MCA) is a scientific discipline dealing with methods and techniques used to compare objects (e.g., enterprises, clients, products) de-

scribed by means of many qualities (Chałaj, 2002, p. 94). Thus, MCA examines complex phenomena, i.e. the ones which cannot be measured in a direct way, and which depend on at least two different variables, observations on which are known. A complex phenomena is, for instance, a competitive position of an enterprise which may be described by means of a group of chosen statistical qualities (Wasilewska, Jasiakiewicz 2000, p.276).

With regard to the examination of complex phenomena, a situation often occurs in which variables describing such a phenomenon are expressed in various units of measurement and/or differ in quantities. However, the methods of multidimensional comparative analysis may be used only when all the variables are expressed in the same units of measurement similar in quantities. This implies that using MCA methods should be preceded with variables normalization which aims at standardizing different units of measurement as well as standardizing different quantities of variables.

Standardization is one of normalization methods. It has been carried out according to the formula below (Tarczyński and others 1995, p.124):

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{S(x_j)}, \qquad (i = 1, 2, ..., n; j = 1, 2, ..., m), \tag{1}$$

where:

- i - the number of an object,
- n - the number of objects under examination,
- j - the number of a quality,
- m - the number of qualities under examination,
- x_{ij} - the value of j quality for i object
- $\bar{x}_j$ - weighted average of X_j quality
- $S(x_j)$ - standard deviation of X_j quality,
- Z_{ij} - standardized value of X_j quality for i object.

After standardization, all the variables have not been called. What is more, they are uniform with regard to a general tendency as well as characterized by identical diversity. This results from the fact that after standardization:

- weighted average of each variable amounts to 0,
- variation and deviation of each variable amounts to 1.

Representing the essence of standardized sums method

Taxonomy is one of the branches of multidimensional comparative analysis. It is used in the case of the following two issues:

A) the examination of the similarities between objects with regard to the level of complex phenomenon with the use of grouping methods (discrimination or classification),
B) the arrangement of objects according to the level of complex phenomenon with the use of linear organization methods.

The aim of linear organization methods is to put objects in order from the best to the worst, i.e. the creation of a kind of ranking, and the criterion for organizing them is a level of complex phenomenon (Kandyba, Koczkodaj, Boryszewska 1999, p. 113). In the present section, such a complex measure, on the basis of which the arrangement of objects will be done, is a competitive position of an enterprise.

The specificity of linear organization methods is that they, in contrast with other MCA

methods, are required to determine the character of all the variables describing the complex phenomenon under examination. For, in these methods it is necessary that all the variables were stimuli in nature.

In the present section, one of the most often used linear organization methods has been followed, namely standardized sums method. This consists of two stages (Dziechciarz 2002, p. 290). During the first stage, the sum of the values of variables is calculated for every object according to the following formula:

$$p_i = \sum_{j=1}^{m} z_{ij} , \tag{2}$$

where:

z_{ij} – the value of i variable standardized for i object,
p_i – the value of a sum standardized for i object.

While using (2) formula, it is assumed that all the variables describing the complex phenomenon have a uniform influence on the level of this phenomenon. Yet, in practice particular variables may have different influence on the level of complex phenomenon and then weights are used. When p_i weights are used, average weights are determined from standardized values of variables for every object. This is shown by the formula:

$$p_i = \sum_{j=1}^{m} z_{ij} \cdot w_j , \tag{3}$$

where:

w_j – weight ascribed to j variable.

Thus (3) formula is a generalization of (2) formula.

Weights should be selected in such a way so that they would meet the following requirements:

1) $w_j > 0$,

2) $\sum_{j=1}^{m} w_j = 1$.

On the other hand, during the second stage so-called development measure is determined for each object according to the formula:

$$m_i = \frac{p_i - p_{-0}}{p_0 - p_{-0}}, \qquad (i = 1, 2, ..., n). \tag{4}$$

In the case of identical weights of particular variables describing complex phenomenon, p_0 and p_{-0} quantities are determined from the following formulas:

$$p_0 = \sum_{j=1}^{m} z_{0j} , \tag{5}$$

$$p_{-0} = \sum_{j=1}^{m} z_{-0j} . \tag{6}$$

On the other hand, while using the weights differentiating the influence of variables under examination on the level of complex phenomenon, quantities p_0 and p_{-0} are determined from the following formulas:

$$p_0 = \sum_{j=1}^{m} z_{0j} \cdot w_j \,, \tag{7}$$

$$p_{-0} = \sum_{j=1}^{m} z_{-0j} \cdot w_j \,. \tag{8}$$

Hence, (7) and (8) formulas are generalizations of (5) and (6) formulas.

Z_{0j} as well as Z_{-0j}, that can be found in (5), (6), (7) and (8) formulas, are values of variables for hypothetical objects under analysis, respectfully model and anti-model. On the other hand, these values are determined according to (9) and (10) formulas (Majewska 2000, p.74):

$$z_{0j} = \max_i z_{ij}, \tag{9}$$

$$z_{-0j} = \min_i z_{ij} \,. \tag{10}$$

The higher the standardized sum (p_i) for i object, the higher the level of complex phenomenon by which this object can be characterized. Thus, just on the basis of the values of standardized sums determined, these objects may be put in order according to the level of complex phenomenon, from the best to the worst. On the other hand, calculating the measures of m_i development aims at obtaining normalized values of these sums as particular m_i values are in the 0 to 1 bracket, and the measure of development determined for the model of development equals 1, whereas for anti-model amounts to 0.

The arrangement of companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw

The examination of companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw was based on the following three variables:
1) net profits from sale,
2) average rate of changes in net profits from sale,
3) the rate of return on assets.

These variables determine a competitive position of firms under consideration in an undoubtedly significant way. Net profits from sale determine a share of a particular firm in the market. On the other hand, average rate of changes in net profits from sale is an average relative continued increase calculated for the years 2001-2005. This variable shows the dynamics of a rise in net profits from the sale of products, materials, and goods, and therefore determines whether a company successively reduces or increases its share in the market. On the other hand, the rate of return on assets enables to evaluate whether an enterprise takes rational actions influencing the development of sale, or maybe increases profits, at the same time lowering the level of profitability. The latter situation would have occurred, for instance, when a company, in order to increase the level of sales, would have drastically lowered the price and, as an effect, reduced sales profitability.

In the present paper, the analysis involved twenty six companies (objects) (n = 26) and examined them with regard to three qualities (m = 3). Table shows 78 observations (n x m = 78) referring to companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw in October 2006. Data reflecting the values of profits from sale as well as the rates of return on assets were obtained in 2005.

Attention should be paid to the fact that variables chosen for the examination, which determine a competitive position of companies under analysis, bear different names and quantities. Hence, a condition, which allows for using the methods of multidimensional comparative analysis, is not met. Therefore, the normalization of variables is necessary. A procedure of standardization has been used to normalize variables. In order to do so, a weighted average and standard deviation for each variable before standardization have been determined. The last two lines of table 1 show these quantities.

Table 1. Profits from sale and rate of return on assets in 2005 as well as average annual rate of changes in profits for the years 2001-2005 for companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw; weighted averages and standard deviations determined for particular variables before standardization.

Item number	The name of a firm	Net profits from sale (in thousand zlotys)	Average annual rate of changes in profits (in %)	Rate of return on assets (in %)
1	BUDOPOL-WROCŁAW	32,692	-10.3	-27.9
2	BUDIMEX	416,322	-6.1	-1.7
3	ECHO INVESTMENT	228,476	-9.9	1.1
4	ELKOP	5,343	-21.0	-24.6
5	ELEKTROBUDOWA	334,795	9.3	5.1
6	ELEKTROMONTAŻ-WARSZAWA	5,670	-46.0	-33.1
7	ELEKTROMONTAŻ-EXPORT	67,810	-26.0	-3.2
8	ENERGOAPARATURA	20,002	-21.5	2.6
9	ENERGOMONTAŻ-POŁUDNIE	121,005	2.2	2.7
10	ENERGOPOL-POŁUDNIE	45,231	-0.6	1.2
11	ENERGOMONTAŻ-PÓŁNOC	68,167	-29.5	-34.7
12	GLOBE TRADE CENTRE	10,185	-12.7	6.7
13	HYDROBUDOWA ŚLĄSK	111,194	4.2	-117.7
14	INSTAL-KRAKÓW	154,697	0.6	2.3
15	INSTAL-LUBLIN	34,259	-16.3	3.6
16	MOSTOSTAL PŁOCK	91,211	-1.9	1.7
17	MOSTOSTAL WARSZAWA	206,998	-11.8	-16.7
18	MOSTOSTAL-EXPORT	32,462	-35.3	-28.5
19	MOSTOSTAL ZABRZE	80,981	-34.3	-31.4
20	NAFTOBUDOWA	93,677	-7.1	-1.9
21	PBG	300,487	25.7	3.6
22	PROJPRZEM	120,590	14.6	9.0
23	PEMUG	68,287	-3.3	18.2
24	POLNORD	365,461	8.8	0.4
25	PROCHEM	565,468	62.9	5.4
26	POLIMEX-MOSTOSTAL	1,342,134	41.8	4.1
Weighted average		189,369	-4.7	-9.8
Standard deviation		275,823	23.7	26.6

Source: own calculations based on financial results of companies in the construction sector quoted on Warsaw's Stock Exchange in Warsaw (NOTORIA SERVIS: *Financial results of public companies*)

Normalized variables concerning public companies in the construction sector has been shown in table 2. By means of this table, it has also been proven that weighted averages for particular variables standardized amount to 0, and standard deviations for these variables equate 1, which confirms that calculations made are correct.

Table 2. Variables after standardization for companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw.

Item number	Abbreviation	Z_1	Z_2	Z_3
1	BDL	-0.5680	-0.2340	-0.6812
2	BDX	0.8228	-0.0570	0.3025
3	ECH	0.1418	-0.2154	0.4077
4	EKP	-0.6672	-0.6839	-0.5573
5	ELB	0.5272	0.5942	0.5578
6	ELW	-0.6660	-1.7427	-0.8764
7	ELX	-0.4407	-0.8970	0.2462
8	ENP	-0.6140	-0.7065	0.4640
9	EPD	-0.2479	0.2925	0.4677
10	EPL	-0.5226	0.1770	0.4114
11	EPN	-0.4394	-1.0452	-0.9365
12	GTC	-0.6496	-0.3342	0.6179
13	HBD	-0.2834	0.3784	-4.0527
14	INK	-0.1257	0.2272	0.4527
15	INS	-0.5624	-0.4867	0.5015
16	MSP	-0.3559	0.1189	0.4302
17	MSW	0.0639	-0.2982	-0.2607
18	MSX	-0.5689	-1.2890	-0.7037
19	MSZ	-0.3930	-1.2480	-0.8126
20	NFT	-0.3469	-0.1006	0.2950
21	PBG	0.4029	1.2845	0.5015
22	PJP	-0.2494	0.8153	0.7043
23	PMG	-0.4390	0.0625	1.0497
24	PND	0.6384	0.5697	0.3814
25	PRM	1.3635	2.8557	0.5691
26	PXM	4.1794	1.9624	0.5203
Weighted average		0.0	0.0	0.0
Standard deviation		1.0	1.0	1.0

Source: own compilation based on table 1.

When all the variables describing the complex phenomenon under examination had been standardized, their character was determined. As it has already been mentioned, as for standardized sums method, all the variables should be stimuli in nature, and if there are destimuli or nominants they have to be transformed into stimuli. In the present research, all three variables describing the complex phenomenon under consideration are stimuli in nature. This implies that a higher value of variables will influence an increase in a standardized sum calculated for a particular company, and thus this company will have a more competitive position in comparison with other objects.

Since after standardization all the variables had already been devoid of units, and were identical in quantity and stimuli in nature, the next step was a standardization of objects. (3) formula was used to calculate p_i standardized sums. As it turns out from the construction of this formula, weights have to be ascribed to all the variables. Variables under consideration have been ascribed weights the values of which were respectively 40%, 30%, and 30%. The level of weights has been determined on the basis of the assumption that as far as the evaluation of competitive position of a company is concerned, net profits from sale are the most important as they determine a share of a company in the market in a direct way. On the other hand, an average annual rate of changes in these profits as well as the rate of return on assets are also important for the evaluation of competitive position of a company, but this impor-

tance is secondary with reference to profits from sale.

Competitive position of companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw

Another step is to determine values of particular qualities for the model and anti-model of development. In order to do so, (9) and (10) formulas have been used. On the other hand, the values of measures of m_i development have been calculated on the basis of p_i standardized sums. Table 3 shows results that have been received, and also m_i values put in order from the highest to the lowest.

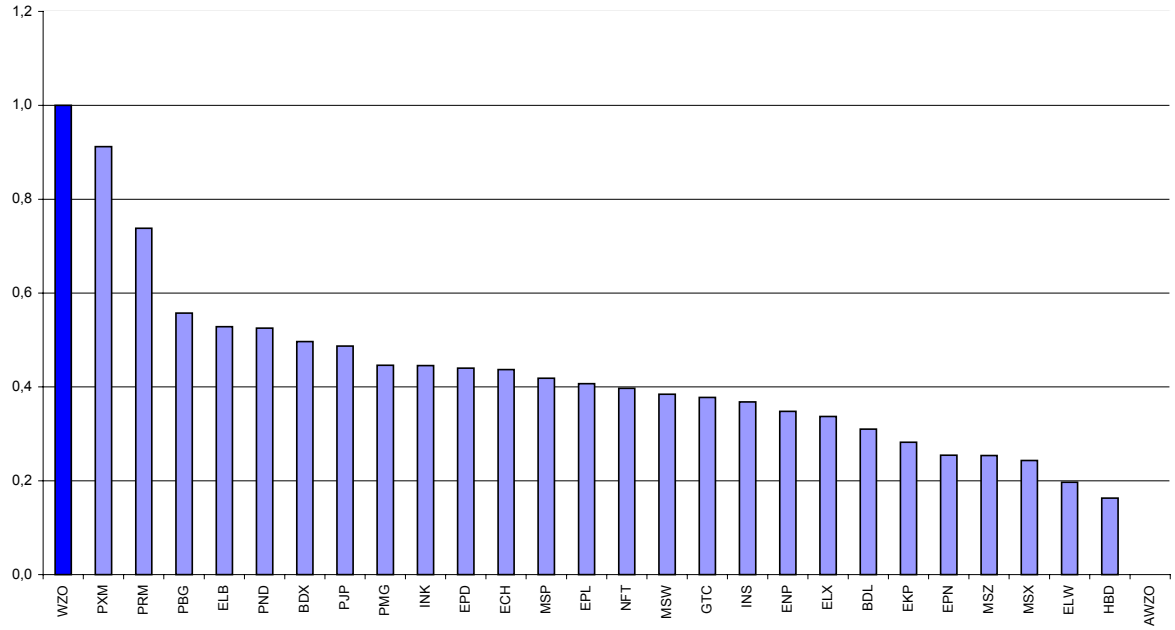
Table 3. The ranking of companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw.

The abbreviated name of a firm	Z_1	Z_2	Z_3	p_i	m_i
WZO	**4,1794**	**2,8557**	**1,0497**	**2,8434**	**1,0000**
PXM	4,1794	1,9624	0,5203	2,4166	0,9120
PRM	1,3635	2,8557	0,5691	1,5729	0,7380
PBG	0,4029	1,2845	0,5015	0,6969	0,5573
ELB	0,5272	0,5942	0,5578	0,5565	0,5284
PND	0,6384	0,5697	0,3814	0,5407	0,5251
BDX	0,8228	-0,0570	0,3025	0,4028	0,4967
PJP	-0,2494	0,8153	0,7043	0,3561	0,4870
PMG	-0,4390	0,0625	1,0497	0,1581	0,4462
INK	-0,1257	0,2272	0,4527	0,1537	0,4453
EPD	-0,2479	0,2925	0,4677	0,1289	0,4402
ECH	0,1418	-0,2154	0,4077	0,1144	0,4372
MSP	-0,3559	0,1189	0,4302	0,0224	0,4182
EPL	-0,5226	0,1770	0,4114	-0,0325	0,4069
NFT	-0,3469	-0,1006	0,2950	-0,0804	0,3970
MSW	0,0639	-0,2982	-0,2607	-0,1421	0,3843
GTC	-0,6496	-0,3342	0,6179	-0,1747	0,3776
INS	-0,5624	-0,4867	0,5015	-0,2205	0,3681
ENP	-0,6140	-0,7065	0,4640	-0,3184	0,3479
ELX	-0,4407	-0,8970	0,2462	-0,3715	0,3370
BDL	-0,5680	-0,2340	-0,6812	-0,5018	0,3101
EKP	-0,6672	-0,6839	-0,5573	-0,6392	0,2818
EPN	-0,4394	-1,0452	-0,9365	-0,7703	0,2547
MSZ	-0,3930	-1,2480	-0,8126	-0,7754	0,2537
MSX	-0,5689	-1,2890	-0,7037	-0,8254	0,2434
ELW	-0,6660	-1,7427	-0,8764	-1,0521	0,1966
HBD	-0,2834	0,3784	-4,0527	-1,2157	0,1629
AWZO	**-0,6672**	**-1,7427**	**-4,0527**	**-2,0055**	**0,0000**

Source: own compilation based on table 2.

Chart 1 was built on the basis of sorted m_i values.

Chart 1. The measures of development for particular companies in the construction sector quoted on the Warsaw Stock Exchange in Warsaw.



Source: own compilation based on table 3.

Therefore, PXM is the best of companies under analysis. Yet, its values for all the qualities under consideration are not the highest, so it has not become a model of development. However, there are 8.8 percentage points (out of 100) missing so that this company could become a model which means that it is very different from the anti-model (as there are the remaining 91.2 percentage points which differ the company under consideration from the anti-model). Another very good company is PRM, for which the measure of development differs from the measure of development of the best company (PXM) by 17.4 percentage points out of 100.

None of companies under analysis has become an anti-model of development. This implies that HBD company, which has turned out to be the worst out of twenty six companies, has higher values of some variables than other objects. HBD company differs from the anti-model of development by 16.29 percentage points out of 100, and thus there are 83.71 percentage points (out of 100) missing so that this company could become a model of development. On the other hand, HBD company differs from the best of the remaining twenty five companies by 74.91 percentage points.

Conclusion

Putting the objects in order from the best to the worst allowed for drawing the conclusion that it is not possible to indicate a company which would have the most advantageous values of all the variables under analysis, and therefore could become a model of development. Yet, the best company of all the examined companies (PXM) is definitely better from the second one (PRM). Thus, it may be stated that PXM is definitely a leader with regard to competitive position, outdistancing all other twenty five companies in the construction sector under analysis.

In the case of the worst, with respect to competitive position, company (HBD), not all the variables are at the least advantageous level, taking the entire group of twenty six companies that have been examined into account. That is why this company, although worse from

the remaining twenty five, has not become an anti-model of development.

Attention should also be paid to the fact that a measure of m_i development of only five companies is higher than 50 percentage points out of 100, and the measure of development of as many as 21 companies is lower than 50 percentage points in 100. This implies that in the group of Polish companies in the construction sector that have been quoted on the Warsaw Stock Exchange in Warsaw, companies which are closer to anti-model than the model of development are definitely greater in number. Hence, these are slightly competitive companies in the sector under consideration.

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