

## STATISTICAL ANALYSIS OF FINANCIAL AND ECONOMIC CONDITION IN COMPANIES LISTED ON THE WARSAW STOCK EXCHANGE

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### Abstract

The analysis of securities is an essential element of investment. It is a complex and, very frequently, long-lasting process. Depending on the assumed time perspective of an investment, the analysis may be carried out on the basis of appropriate tools within technical or fundamental analysis. Assuming that the investment is long-term, the methods of fundamental analysis, particularly the indicator analysis are be useful. Additionally, in securities analyses taxonomic methods are more frequently used, which allows for the evaluation of the securities quality through the synthetic analysis of statistical economic and financial indicators. Methods of linear arrangement used to assess the companies' fundamental strength are based on the economic and financial indicators. These indicators define in a numerical manner the relations between economic and financial values, which allows for conclusions on the condition of the examined economic entities, sectors or markets. Furthermore, indicators are a source of data in quantitative analyses, they are diagnostic variables in research studies. Thus this situation poses a few crucial questions:

- how do the economic and financial indicators rule on the stock market ?
- what is their level, do they maintain the norms ?
- what is the quality of data on the basis of which securities analyses are carried out ?

The main goal of the article is to analyze the fundamental power of companies listed on Warsaw Stock Exchange (*WSE*) by using *TMAI* value (in space and time). The study was performed in the period of 2005–2008 (the first quarter of 2008). Thus, the base was constituted by 126 companies. Banks and other financial institutions were excluded. Within the macrosectors existing on the Polish capital market, a statistical analysis of the level of economic and financial indicators characterizing particular companies was performed.

**Key words:** investment, analysis of securities, fundamental analysis, sector analysis indicator analysis, synthetic measure of development, numerical methods, statistical analysis.

**JEL classification:** C10, G10.

## Introduction

The analysis of securities is an essential element of an investment. It is a complex and, very frequently, long-lasting process. Depending on the assumed time perspective of the investment, the analysis may be carried out on the basis of appropriate tools within technical or fundamental analysis. Assuming that the investment is long-term, the methods of fundamental analysis, particularly the indicator analysis are be useful. Additionally, in securities analyses taxonomic methods are more frequently used, which allows for the evaluation of the securities quality through the synthetic analysis of statistical economic and financial indicators. The combination of elements of the fundamental analysis with statistical, multidimensional methods may be presented in the following manner:

- the study of the companies' fundamental strength, in other words the attractiveness of securities, through the prism of a synthetic combination of economic and financial indicators as an element of the analysis of securities;
- the use of economic and financial indicators as diagnostic variables in multidimensional analyses (e.g. to construct data bases and ways of their utilization in portfolio analyses);
- the study of levels of economic and financial indicators enabling the assessment of the stock companies' level of development, and indirectly, the assessment of the development of the capital market in Poland.

It is essential, however, to examine the quality of data being used to create synthetic measures. Thus, alongside this examination, the fundamental strength or the economic and financial potential of the companies are evaluated. These expectations may be fulfilled thanks to quantitative methods.

The problem of data quality, actually their evaluation, may be carried out with the help of statistical analysis, particularly of the parameters of descriptive statistics. Such a manner of tackling the problem allows for not only explaining the value of synthetic measures, but also for showing the level reach of certain indicators for companies (e.g. on the market or in sectors). In this scope, comparisons both in time and space are correct. Moreover, statistical studies may lead to the search and definition of standard values for the market, sector or group of companies. They indicate and confirm at the same time the disproportions in the levels of economic and financial indicators and development of companies. Both these

elements influence the evaluation of the companies' fundamental strength and, at the same time, the evaluation of the economic and financial potential they have at their disposal.

Methods of linear arrangement, mainly the synthetic measures of development<sup>1</sup>, enable the classification of companies (entities) in relation to the set variables and by the use of one synthetic dimension they define their fundamental strength. Thus, on the one hand, the level of synthetic measures reflects the economic and financial condition of the examined companies and, indirectly, gives evidence about the capital market development level in Poland. On this basis, one can also make an evaluation of the economic and financial potential the studied companies are vested with. Methods of linear arrangement used to assess the companies' fundamental strength are based on the economic and financial indicators. These indicators define in a numerical manner the relations between economic and financial values, which allows for conclusions on the condition of the examined economic entities, sectors or markets. Furthermore, the indicators are a source of data in quantitative analyses, they are diagnostic variables in research studies. Their value directly influences the level of synthetic measures or the quality of classification. Therefore, there arises an essential problem connected with the quality of statistical data used as a basis for analyses. From the studies carried out for the Polish market with the use of linear arrangement measures it can be seen that the level of synthetic measures for companies classified as good (potentially attractive in terms of investment and fundamentally strong) oscillates most often between values 0.3-0.5. It has to be stressed that in measures based on the synthetic measure of development, normalized within the limits between 0 and 1, the entities (companies) regarded as those having a good level of development are those for which the level of synthetic measure is the highest. This situation poses, then, a few crucial questions:

- how do the economic and financial indicators rule on the stock market?
- what is their level, do they maintain the norms?
- what is the quality of data on the basis of which securities analyses are carried out?

## **Empirical Research**

The main goal of the article is the analysis of fundamental power of the companies listed on Warsaw Stock Exchange (*WSE*) by using *TMAI* value (in space and time). The study was performed in the period of 2005-2008 (the first quarter of 2008), but in all the analyses only full data were used. Companies which entered the market after 2005 were excluded from

the analysis. Thus, the base was constituted by 126 companies. Banks and other financial institutions were excluded as well.

Within the macrosectors existing on the Polish capital market, a statistical analysis of the level of economic and financial indicators characterizing particular companies was performed. In the statistical study classic and positional mean values<sup>2</sup> were calculated together with the corresponding measures of volatility and variability ( $\bar{x}$  – mean,  $M$  – median,  $S(x)$  – standard deviation,  $V_S$  – classical variability coefficient).

Companies are divided into three macrosectors: industry ( $MI$ ) – (70 companies), trade and services ( $MTS$ ) – (56 companies), finances and insurance (15 companies). Additionally, for the selected macrosectors and economic and financial indicators that define them, the levels of synthetic measures were set with the help of  $TMAI^3$ .

For the methods chosen for the analysis, the set of diagnostic characteristics comprises:

- profitability indicators: return on equity ( $ROE$ ), return on assets ( $ROA$ ),
- liquidity indicator: current ratio ( $WPB$ ),
- activity indicators: receivables turnover ratio ( $RN$ ), inventory turnover ratio ( $RZ$ ), payables turnover ratio ( $RZob$ ), asset turnover ratio ( $RA$ ),
- debt indicator: debt ratio ( $StZd$ ).

Out of the selected variables<sup>4</sup>, the receivables turnover ratio, inventory turnover ratio and payables turnover ratio, as well as the debt ratio have been treated as destimulants. The current ratio for non-financial companies is the nominat, and the remaining variables have been regarded as stimulants. These variables are commonly available and published, e.g. by Notoria Serwis in quarterly and annual configurations for all companies, which means that the analyses proposed in the article should not pose a problem as for the availability of data.

The results of the analysis have been presented in Tables 1 to 6 in Annex. The conclusion from the analysis of the data presented in Tables 1, 2 and 3 is that the average level of synthetic measures oscillates within the range from 0.1 to 0.5. This proves rather low level of development in the analyzed companies. Considering the fact that these are stock companies, the news sounds even less optimistic. The stock exchange is often described as the economy barometer, and looking through the prism of stock companies analysis, we may discuss the state of the economic situation. Unfortunately, in this field the situation is not good. While analyzing the levels of statistical parameters of mutability and variability, among

the analyzed companies disproportions can be seen not only with a view to synthetic values, but also to the economic and financial indicators which constitute these measures (Tables 4, 5 and 6). In particular, this is indicated by the classic variability indicators  $V_S$ , which are significantly higher than the statistically acceptable range of small variability (0-10%).

The level of synthetic measure enables defining the companies' (or a company's) fundamental strength. In relation to that, at low values of the *TMAI* (and as the study shows, they are such on average), we may speak of existing, but not yet used economic potential in stock companies. With regard to the market situation and having considered the fact that the Polish market still finds itself in its development phase, such a thesis seems true. Moreover, Tables 1, 2 and 3 also show what the state of the economic development is in macrosectors and sectors. On average, the highest values were obtained in the industry macrosector. However, doubt is raised by a very high variability ( $V_S$ ) of synthetic measures. It stems from the large differences between particular economic and financial indicators constituting diagnostic variables. This is even more obvious after analyzing the results shown in Tables 4-6, which present chosen statistical parameters of economic and financial indicators in the period of 2005-2008, for macrosectors, sectors and all analyzed companies as total.

In this domain, again a high variability of values of indicators obtained by companies has been confirmed, which proves that certain companies are characterized by a very good economic and financial condition, while others – by a very weak one. Such a thesis is correct for all analyzed sub-groups. Generally, it has to be stated that stock companies are struggling with economic and financial problems. Evaluating their economic potential it may be said that there is still a lot to be done in this field. First, the condition of companies needs to be improved in a way that would enable its appropriate use for the aim of improving the economic situation of the sector, macrosector and, thus, the market as a whole.

## Conclusions

The research that has been carried out shows the disproportions on the level of the studied economic and financial indicators, which confirms the differences between certain macrosectors, i.e. between companies that form them (the character of company activity in sectors, the level of their development) and the whole market. The tide of the market is not good, but we may observe certain growth tendencies.

After having done the research, we can see that the presented division into macrosectors on the Polish capital market is not perfect. The sectors are too diversified as for

number, which may cause analytical difficulties. Despite the shortcomings of the division, the analyses of this kind should be performed due to their applicability in the analyses of securities, the possibility they offer to evaluate the market and its sectors, including the companies as their components.

## APPENDIX

Table 1. Statistical characteristics of *TMAI* for *WSE* companies in 2005-2008

	years	$\bar{x}$	$M$	$S(x)$	$V_s$
<i>TMAI AC<sup>5</sup></i>	2005	0.4591	0.4728	0.0903	0.1966
	2006	0.3203	0.3263	0.0809	0.2525
	2007	0.3681	0.3732	0.0977	0.2655
	2008	0.3428	0.3532	0.0850	0.2480
<i>TMAI MTS</i>	2005	0.4805	0.5036	0.1182	0.2461
	2006	0.3442	0.3450	0.0992	0.2881
	2007	0.4160	0.4339	0.1221	0.2935
	2008	0.3547	0.3694	0.1054	0.2971
<i>TMAI MI</i>	2005	0.3945	0.4173	0.1209	0.3064
	2006	0.3423	0.3576	0.0922	0.2694
	2007	0.2976	0.2989	0.0833	0.2799
	2008	0.3598	0.3617	0.0880	0.2445

Source: own calculations.

Table 2. Statistical characteristic of *TMAI MI* for *WSE* companies in 2005-2008

<i>TMAI's for sectors</i>	years	$\bar{x}$	$M$	$S(x)$	$V_s$
<i>TMAI OTHER</i>	2005	0.3365	0.4036	0.2037	0.6054
	2006	0.3167	0.3438	0.1928	0.6088
	2007	0.3829	0.4243	0.1093	0.2853
	2008	0.3538	0.3758	0.0965	0.2727
<i>TMAI FOOD</i>	2005	0.2533	0.2612	0.1537	0.6070
	2006	0.2401	0.2383	0.1393	0.5803
	2007	0.1775	0.2102	0.1259	0.7094
	2008	0.0987	0.0782	0.0924	0.9370
<i>TMAI METALS</i>	2005	0.2885	0.2691	0.1495	0.5181
	2006	0.2146	0.2301	0.1619	0.7542
	2007	0.2093	0.1454	0.1776	0.8487
	2008	0.2484	0.2325	0.1567	0.6307
<i>TMAI BUILDING MATERIALS</i>	2005	0.2331	0.2556	0.1197	0.5133
	2006	0.1155	0.1079	0.0827	0.7160
	2007	0.1579	0.1564	0.1569	0.9940
	2008	0.2826	0.3177	0.1550	0.5484
<i>TMAI LIGHT INDUSTRY</i>	2005	0.3817	0.4363	0.1942	0.5088
	2006	0.4472	0.4638	0.2548	0.5697
	2007	0.3856	0.3898	0.2044	0.5302
	2008	0.4042	0.4347	0.1529	0.3782
<i>TMAI ELECTROENGINEERING</i>	2005	0.2801	0.2829	0.1549	0.5530
	2006	0.2347	0.1859	0.1793	0.7641
	2007	0.2548	0.2315	0.1302	0.5108
	2008	0.2922	0.2598	0.1371	0.4691
<i>TMAI WOOD AND PAPER</i>	2005	0.3133	0.3107	0.2196	0.7009
	2006	0.3836	0.4061	0.2183	0.5691
	2007	0.3028	0.3261	0.1548	0.5112
	2008	0.2654	0.2189	0.1307	0.4926
<i>TMAI CHEMISTRY</i>	2005	0.2854	0.3608	0.1413	0.4953
	2006	0.2992	0.3452	0.1407	0.4702
	2007	0.2631	0.2953	0.1383	0.5255
	2008	0.3251	0.3656	0.1456	0.4478

Source: own calculations.

Table 3. Statistical characteristic of *TMAI MTS* for *WSE* companies in 2005-2008

	years	$\bar{x}$	M	S(x)	Vs
<i>TMAI MEDIA</i>	2005	0.3410	0.3999	0.1963	0.5757
	2006	0.3292	0.3343	0.1781	0.5410
	2007	0.4029	0.4876	0.1886	0.4681
	2008	0.3628	0.4236	0.1391	0.3836
<i>TMAI OTHER</i>	2005	0.4020	0.4364	0.1665	0.4142
	2006	0.1907	0.1768	0.1365	0.7157
	2007	0.2585	0.2441	0.1952	0.7551
	2008	0.2716	0.2990	0.1720	0.6331
<i>TMAI IT</i>	2005	0.1901	0.1620	0.1472	0.7742
	2006	0.2551	0.2297	0.1749	0.6858
	2007	0.2253	0.2616	0.1419	0.6298
	2008	0.2117	0.2275	0.1428	0.6743
<i>TMAI RETAILS</i>	2005	0.1872	0.1537	0.2155	1.1514
	2006	0.2386	0.2422	0.1547	0.6484
	2007	0.2904	0.3073	0.1670	0.5751
	2008	0.2903	0.3067	0.1824	0.6283
<i>TMAI TRADE</i>	2005	0.1708	0.1769	0.1122	0.6570
	2006	0.1239	0.0868	0.1077	0.8688
	2007	0.2035	0.1859	0.1238	0.6084
	2008	0.2311	0.2555	0.1408	0.6095
<i>TMAI CONSTRUCTION</i>	2005	0.3672	0.4225	0.1532	0.4172
	2006	0.3885	0.4090	0.1554	0.3999
	2007	0.2352	0.2626	0.1201	0.5105
	2008	0.3069	0.3333	0.1350	0.4398

Source: own calculations.

Table 4. Statistical measures of economic and financial indicators for all companies in 2005-2008

Stat. for AC		$\bar{x}$	M	S(x)	Vs
<i>ROE</i>	2005	0.093	0.101	0.199	2.131
	2006	0.097	0.110	0.164	1.683
	2007	0.122	0.115	0.143	1.179
	2008	0.117	0.099	0.138	1.184
<i>ROA</i>	2005	0.059	0.046	0.080	1.360
	2006	0.058	0.054	0.088	1.505
	2007	0.071	0.061	0.083	1.173
	2008	0.067	0.056	0.082	1.234
<i>WPB</i>	2005	1.915	1.625	1.078	0.563
	2006	1.833	1.607	1.017	0.555
	2007	1.927	1.652	1.114	0.578
	2008	1.812	1.635	0.950	0.524
<i>RN</i>	2005	86.2	75.7	58.0	0.673
	2006	86.0	72.1	60.0	0.698
	2007	91.0	75.2	70.1	0.771
	2008	93.8	78.6	80.0	0.853
<i>RZap</i>	2005	50.9	38.4	55.4	1.089
	2006	50.0	38.3	55.5	1.108
	2007	53.4	41.3	55.1	1.031
	2008	56.3	42.2	64.0	1.136
<i>RZob</i>	2005	112.5	98.5	71.6	0.637
	2006	115.7	90.7	85.4	0.738
	2007	124.1	99.9	77.9	0.628
	2008	126.9	102.8	81.9	0.645



<i>RA</i>	2005	382.4	298.5	285.9	0.748
	2006	396.3	292.4	326.7	0.824
	2007	453.5	339.7	370.9	0.818
	2008	512.4	359.3	485.9	0.948
<i>SZ</i>	2005	0.439	0.418	0.179	0.408
	2006	0.441	0.443	0.171	0.388
	2007	0.410	0.400	0.174	0.425
	2008	0.411	0.384	0.166	0.403

Source: own calculations.

Table 5. Statistic measures of economic and financial indicators for the macrosector of trade and services in 2005-2008

Stat. for MHU		$\bar{x}$	M	S(x)	Vs
ROE	2005	0.091	0.100	0.257	2.813
	2006	0.104	0.113	0.152	1.461
	2007	0.134	0.135	0.110	0.819
	2008	0.124	0.108	0.107	0.861
ROA	2005	0.054	0.041	0.077	1.431
	2006	0.054	0.049	0.076	1.400
	2007	0.070	0.068	0.067	0.961
	2008	0.065	0.056	0.063	0.969
WPB	2005	1.845	1.539	1.003	0.544
	2006	1.631	1.586	0.699	0.428
	2007	1.928	1.667	1.109	0.575
	2008	1.821	1.671	0.927	0.509
RN	2005	95.8	76.0	78.3	0.818
	2006	95.6	81.4	79.8	0.834
	2007	101.2	70.1	90.7	0.896
	2008	102.1	76.9	105.6	1.034
RZap	2005	46.1	24.7	73.6	1.597
	2006	44.9	26.4	74.8	1.666
	2007	48.9	30.0	73.0	1.493
	2008	53.2	31.8	87.1	1.637
RZob	2005	119.2	101.7	85.5	0.718
	2006	125.0	88.0	109.8	0.878
	2007	123.3	95.3	81.7	0.662
	2008	124.8	98.7	80.0	0.641
RA	2005	421.5	254.6	394.7	0.936
	2006	439.6	247.8	445.6	1.014
	2007	486.7	284.5	466.1	0.958
	2008	539.6	300.8	612.3	1.135
SZ	2005	0.481	0.466	0.193	0.402
	2006	0.470	0.459	0.186	0.396
	2007	0.445	0.444	0.197	0.443
	2008	0.446	0.428	0.183	0.410

Source: own calculations.

Table 6. Statistic measures of economic and financial indicators for the macrosector of industry in 2005-2008

Industry in 2005-2008					
Stat. for MP		$\bar{x}$	M	S(x)	Vs
ROE	2005	0.097	0.104	0.140	1.447
	2006	0.093	0.110	0.174	1.858
	2007	0.113	0.111	0.165	1.459
	2008	0.112	0.096	0.160	1.430
ROA	2005	0.064	0.057	0.082	1.286
	2006	0.063	0.060	0.097	1.548

	2007	0.073	0.061	0.094	1.299
	2008	0.068	0.057	0.095	1.398
<i>WPB</i>	2005	1.980	1.688	1.141	0.576
	2006	2.001	1.686	1.193	0.596
	2007	1.940	1.560	1.128	0.582
	2008	1.817	1.635	0.975	0.537
<i>RN</i>	2005	77.4	74.1	32.2	0.416
	2006	77.1	70.4	35.5	0.460
	2007	81.4	75.2	46.0	0.566
	2008	86.2	78.6	51.6	0.599
<i>RZap</i>	2005	54.9	47.1	35.9	0.653
	2006	54.3	46.0	33.9	0.625
	2007	57.4	49.2	35.8	0.624
	2008	59.2	50.4	38.1	0.643
<i>RZob</i>	2005	105.5	93.3	57.2	0.542
	2006	107.0	90.7	59.0	0.552
	2007	122.1	103.1	72.8	0.596
	2008	125.9	105.3	81.5	0.647
<i>RA</i>	2005	345.7	322.0	144.9	0.419
	2006	356.2	327.5	179.2	0.503
	2007	419.6	349.7	269.9	0.643
	2008	482.2	375.4	356.6	0.740
<i>SZ</i>	2005	0.406	0.410	0.162	0.399
	2006	0.418	0.405	0.157	0.375
	2007	0.384	0.381	0.152	0.395
	2008	0.386	0.366	0.147	0.381

Source: own calculations.

## Notes

- <sup>1</sup> For more information about synthetic measures of development see Grabiński, Wydymus, Zeliaś (1989), Pociecha, Podolec, Sokołowski, Zając (1988).
- <sup>2</sup> More information see e.g. Hozer (1996) or Krzysztofiak (1981).
- <sup>3</sup> TMAI is Taxonomic Measure Attractiveness of Investment which estimates fundamental power of companies. TMAI is described in detail in e.g. Tarczyński (2002).
- <sup>4</sup> Stimulant, destimulant and nominant are the names of variables denoting “positive”, “negative” and “variable with norm” when explaining given dependent variable.
- <sup>5</sup> TMAI AC – TMAI calculated for all companies.

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