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METALLURGICAL INDUSTRY IN ROMANIA IN THE CONTEXT OF THE ECONOMIC CRISIS

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The magnitude of the economic crisis and the influence on the developments of industrial branches was different. Although European economies are strongly interconnected both internally and externally, the way in which an economic branch has crossed and is trying to overcome the economic crisis has some peculiarities arising from its specificity on the one hand, and on the other hand, from the policies applied in the field. Based on these considerations, the paper examines how Romanian metallurgical industry passes through the economic crisis as compared with other industries. Also based on quantitative analyses performed and taking into account the specific phenomenon of seasonality are presented models of evolution of this industry with horizon in February 2015.

Key words: metallurgy, economic crisis, turnover, forecast models, Romania

INTRODUCTION

Metallurgical industry occupied an extremely important place in the Romanian economy, especially before 1990. As in other former communist countries, like for example in Poland [1], privatization and restructuring processes have influenced the evolution of this industry adapting and integrating as well as other branches, in the competitions of market economy.

Certainly, the economic crisis has left its mark on the metallurgical activities which have declined ever since the period before the crisis. From the second half of 2008 it was noted a significant decrease of the indexes of turnover value in metallurgy by 63.4 percentage points, thus reaching a value below the level of 2005. But September 2009 marks the beginning of a process of recovery (increase) when metallurgy industry provided 6,8 % of the industrial output of the country and 8,9 % of the value of manufacturing output [2], the process continuing, so that in March 2013 in Romania there were 20 large metallurgy companies.

An important way of highlighting the economic efficiency of metallurgical industry is the analysis of turnover and the index of turnover. From this point of view a quantitative analysis based on econometric models [3-5] in the period 2000-2012 was remade in our paper „An analysis of the turnover index evolution in metallurgy during 2000-2012. The case of Romania" [6]. This paper represents a continuation of it [6] and other concerns of the authors in this area [7,8] and refers to how metallurgy crossed over economic crisis and its prospects of evolution with horizon in February 2015, through the prism of turnover index in comparison to other manufacturing industries.

The data used in this paper were provided by Romanian state institutions, including: National Statistics Institute [9], and the Ministry of Economy [10].

EVOLUTION OF TURNOVER INDEX OF METALLURGY COMPARED TO THE MANUFACTURING INDUSTRY IN THE PERIOD BEFORE THE ECONOMIC CRISIS

Evolutions of the turnover index in metallurgy (denoted by ITO_M) as comparated to the total manufacturing industry (denoted by ITO_T) in period January 2000 - January 2014 is illustrated in Figure 1.

In the period January 2000 - October 2008, both the turnover of the manufacturing industry and the metallurgy have evolved quite similarly on an upward trend increasing about 5 times. But in 2004, metallurgical industry recorded a different evolution from that of the manufacturing industry in terms of growth rate. As can be seen in Figure 1, the onset of economic crisis has had a much stronger impact on metallurgical industry. From the second half of 2008, ITO evolutions of metallurgy decreased significantly. Over this trend overlaps a seasonal evolution characteristic to this industry.

THREE INDUSTRIES PASSING THROUGH THE ECONOMIC CRISIS

In order to highlight how the metallurgical industry from Romania went through the period of economic crisis it presents a brief comparison of the evolution of turnover index in metallurgy (ITO_M) with turnover in-

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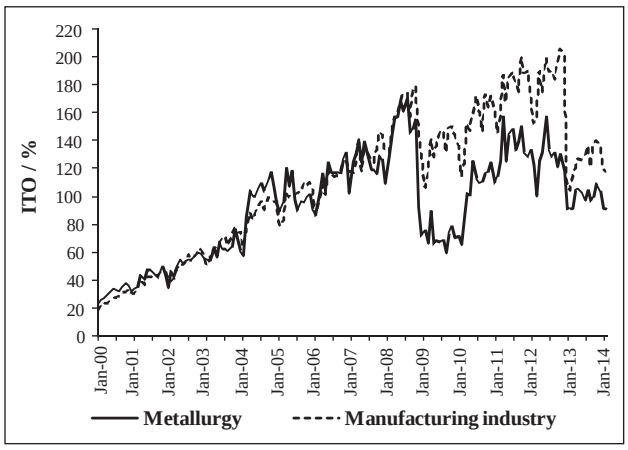

Figure 1 The evolution of ITO of metallurgy and manufacturing industry

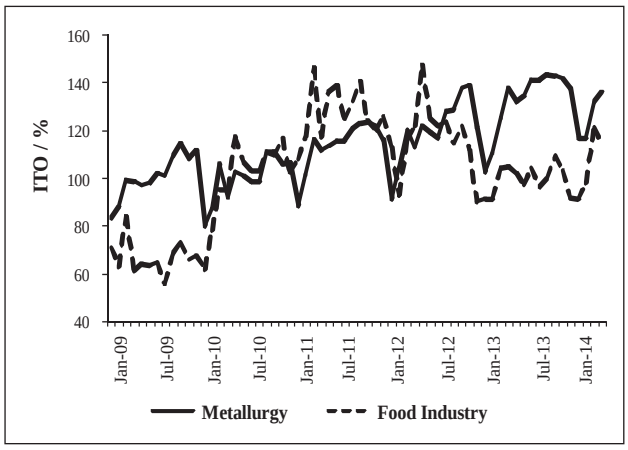

Figura 3 Evolution of ITO of metallurgy and food industry

dex in the food industry (ITO_{FI}) and Manufacture of Fabricated Metal Products (except machinery and equipment), (ITO_{FMP}).

The analysis is based on the series of data corresponding to the values of ITO for the three industries during the period July 2008 to April 2014 [6], having as a basis the average indexes of turnover since 2010 for each of the three industries.

Figure 2 shows the evolution of indexes of turnover in metallurgy and in manufacture of fabricated metal products. As can be seen, the impact of the economic crisis was significantly higher on the manufacture of fabricated metal products, which in the first quarter of 2009 recorded an average index of turnover that was 38,6 % lower than in the last quarter of the year 2008. At the same time, the average of ITO in metallurgy was 16,8 % lower than in the last quarter of the year 2008. Note that it decreased significantly in the fourth quarter as compared to the third quarter of 2008.

The low levels of the two industries is maintained throughout 2009, recording at a quarterly level, very small increases between 6 % and 9 % compared to the first semester in which they recorded the lowest values in the whole period under review. Note, that the level of the index of turnover in metallurgy in 2009 reached about the same level recorded in 2008, while the ITO in manufacture of fabricated metal products was 30 % lower in 2009 compared to 2008.

It is find a relatively similar situation in the early part of the economic crisis in the case of the index of turnover in the food industry (Figure 3). The decline is significant, the average index of turover in the first quarter of 2009 was 27 % lower than in the fourth quarter of 2008. But unlike metallurgy and manufacture of fabricated metal products in food industry, the decline continued in the second semester of 2009 by 13 % so that, compared with the last quarter of 2008 the decrease was of 36,8 %.

2010 is the year that prepares economic recovery in all three industries. For metallurgy and manufacture of fabricated metal products until the end of the analysed period (April 2014) evolutions of indexes of turnover are situated on the upward trends which overlap the seasonal fluctuations caused by the specificity of these two industries (Figure 2). Thus, in the year 2013, the average index of turnover in metallurgy was 32,52 % higher than in 2010 and 6,8 percentage points higher than the level of index of turnover in manufacturing industry.

In contrast with these (Figure 3) after a significant upward evolution in the period 2010 - 2012, in 2013 are notice a significant decline, so that the index of turnover of food industry decreases to 99 % of the level recorded in 2010.

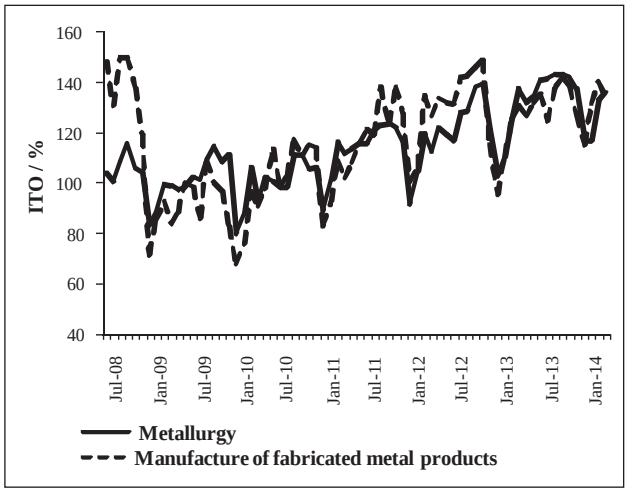

Figure 2 Evolution of ITO of metallurgy and manufacture of fabricated metal products

TWO MODELS OF MEDIUM-TERM FORECAST OF THE INDEX OF TURNOVER IN METALLURGY

Since the series of data used in the study of the evolution of metallurgy during the economic crisis, contain a number of 64 observations there were developed and tested, using Excel, SPSS and EViews [4-6], multiple regression models describing the evolution in time of the index of turnover in metallury during January 2009 through April 2014.

In a first phase, taking into account the obvious seasonality of data series was made the seasonal adjust-

ment methods using additive seasonal movings average method, seasonality factors obtained being presented in Table 1.

Table 1 **Seasonal adjustment factors for index of turnover in metallurgy**

Sample 2009:01 2014:04 Included observations: 64 Difference from Moving Average					
Month	Scaling Factors	Month	Scaling Factors	Month	Scaling Factors
Jan.	-22,318	May	1,634	Sep.	8,092
Feb.	-12,893	Jun.	1,011	Oct.	10,548
Mar.	2,308	Jul.	0,845	Nov.	7,352
Apr	-1,743	Aug.	3,548	Dec.	1,612

Taking into account these, for a level of significance $\alpha = 0,05$ (p = 95 %), five models were tested: linear, logarithmic quadratic, power and exponential.

Table 2 **Resume of results of the regression statistics and the variance analysis**

	Liniar	Log.	Quadratic	Power	Exp.
R	0,797	0,718	0,798	0,725	0,787
R Sqr.	0,635	0,516	0,637	0,526	0,621
F	108,2	66,13	53,56	69,02	101,4
Sig. F	0,000	0,000	0,000	0,000	0,000

As can be seen (Table 2) all models are statistically valid because all Sig. F values are much lower than 0,05.

Next were tested the statistical significances of the coefficients of obtained models. Values of the coefficients and the results of test t (Student), under the same conditions ($\alpha = 0,05$) are shown in Table 3.

Table 3 **Testing statistical significance of coefficients of regression models**

	B	T	Sig.T	B	T	Sig.T
Liniar				Logaritmic		
Time	0,69	10,4	0,000	12,93	8,13	0,00
C	1,58	36,5	0,000	72,78	13,74	0,00
Power				Exponential		
Time	0,116		0,000	0,0006	0,00	
C	77,94		0,000	2,1065	0,00	
Quadratic						
Time	0,571		0,041			
Time**2	0,0019		0,635			
C	92,97		0,000			

Analyzing the results presented in Table 2 shows that the Quadratic model cannot be used since Sig. T = 0,635 > α = 0,05. As a result only the other four models can be used. Of these, taking into account the values of R and R Sqr. the linear model was chosen, for which $R^2 = 0,6977$:

$$ITO_M(t) = 0,6977 \cdot t + 91,585 + s(t) + \varepsilon \qquad (1)$$

and respectively, the exponential model, for which $R^2 = 0,6208$:

$$ITO_M(t) = 92,687 \cdot e^{0,0062 \cdot t} + s(t) + \varepsilon \qquad (2)$$

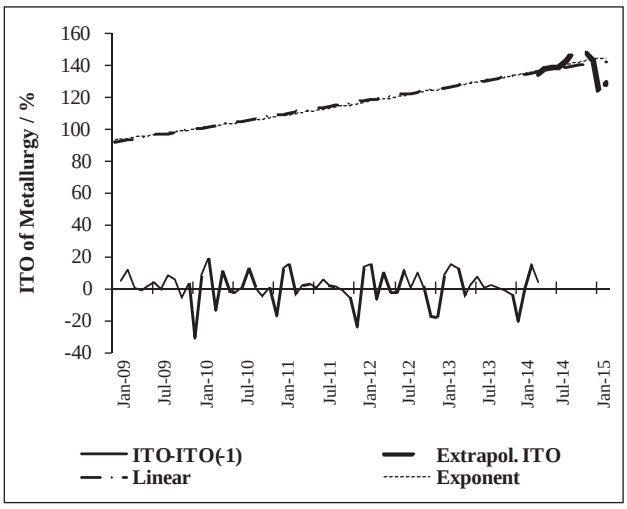

Figure 4 Trend and values of the first difference of the ITO of metallurgy in the analyzed period

In models (1) and (2), s(t) is the term for seasonality, and ε represents the influence of residual factors. As can be seen from Figure 4, their trajectories practically overlap.

In Figure 4 are also represented variants of the prognosis of the index of turnover trends in metallurgy until February 2015. These are presented in detail in table 4. The values represent the means of the confidence intervals for a probability of 95 %.

Table 4 **Forecast values of the index of turnover in metallurgy during the period July 2014-February 2015**

Year	Month	Linear (Model 1)	Expon. (Model 2)
2014	Joule	138,5	139,5
	August	141,9	143,0
	September	147,1	148,4
	Octomber	150,3	151,7
	November	147,8	149,4
	December	142,7	144,5
2015	January	119,5	121,5
	February	128,9	130,9

CONCLUSIONS

The impact of the outbreak of the economic crisis in late 2008 is felt differently across industrial branches and its influence on their long-term developments is different. In order to highlight this fact was realized a comparative analysis of metallurgical industry with the evolutions of the food industry and industry of manufacturing road transport vehicles, trailers and semi-trailers.

Based on the analysis of index values of turnover in metallurgy from January 2009 to April 2014 was made a prediction of this industry with the horizon in February 2015 based on linear and exponential models.

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Note: The responsible translator for English language is the lector Simion Otilia from Faculty of Economics and Business Administration, "Constantin Brancusi" University of Targu Jiu, Romania