THE ANALYSIS OF THE FACTORS THAT INFLUENCE THE TURNOVER IN THE ROMANIAN FOOTWEAR INDUSTRY

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Abstract
Knowing the factors that influence the turnover in the Romanian footwear industry allows the evaluation of the impact that any change of one or many factors will have on it. This article describes the results of the research of the authors on the influencing factors of the turnover from the Romanian footwear industry in the period 2004-2013, establishing an econometric model of analysis between the turnover, on one hand, and the number of entities, the number of employees, the payroll expenses, the net investments realized, the average gross salary and labor productivity on the other hand.

Key words: *turnover, multiple regression, the influence of factors, analysis model*

JEL Classification: C50, D78

1. Introduction

The Romanian footwear industry represents an important sector of national economy, its external competitiveness being proved by the 14th place in the the rating of world footwear exporters.

Even if, in the world, China has managed to consolidate its market share, this leading to a decrease of the turnover of the main world producers, the Romanian footwear industry has constantly developed, increasing from a turnover of 2.560.545.075 lei in 2004 to a turnover of 4.138.309.513 lei in 2013, an increase of 61,62%.

Although, at a first sight, it seems that the competitive advantage of the Romanian footwear industry is the cheap labor, the salary being a lot under

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the European average, we can see that in these 10 years, the average gross salary in the Romanian footwear industry has increased from 511 lei in 2004 to 1.424 lei in 2013, an increase of 178,67%, more that the increase of the turnover, which makes us say that the Romanian footwear industry has become more and more competitive, mainly due to the quality of the products obtained.

The structure of the entities that activate in the Romanian footwear industry has changed in time. So, if in 2004, from the total of 1.594 entities, 47,8% were micro-entities (no more than 9 employees), 24,97% were small entities (between 10 and 49 employees), 22,08% were medium-sized entities (between 50 and 249 employees) and 5,15% were large entities (over 250 employees), in 2013, from the total of 1.207 entities, 45,73% were micro-entities, 33,89% small entities, 16,9% were middle-sized entities and 3,48% were large entities. The change of the structure of entities has also determined a change of the share in the total turnover from the Romanian footwear industry sector. So, if in 2004, the micro-entities had a share of 2,85%, small entities a share of 11,05%, middle-sized entities 40,82% and the large entities a share of 45,28%, in 2013 the micro-entities had a share of 7,23%, small entities 11,41%, middle-sized entities 37,27% and the large entities had a share of 44,09% from the total turnover.

Maintaining the competitiveness of the Romanian footwear industry in the world also depends on identifying the factors that influence the turnover. So, identifying the factors which relate, it's not a purely theoretical matter, but also a matter of planning, understanding of practical instruments which help entities to increase their turnover and the competitiveness on the market.

By identifying the existent correlations between the turnover, on one hand, and the number of entities, the number of employees, the payroll expenses, the net investments realized, the average gross salary and labor productivity on the other hand, it is constituted a starting point for understanding the existing opportunities and, why not, a step for implementing them within future directions.

2. Research methodology

The aim of the research is to establish a multiple regression model to determine the influence of certain indicators over the turnover from the Romanian footwear industry.

In order to realize this model we took into consideration national series of time, for the period 2004-2013, the used data being taken from the National Statistics Institute website http://statistici.insse.ro/shop/?lang=ro.

The dependent variable is the Turnover (CA), and the independent variables corresponding to the possible maximum model are: the number of entities (NE), the number of employees (NA), the payroll expenses (CS), the net investments realized (INR), the average gross salary (SMB) and labor productivity (PM). All the indicators refer to the Romanian footwear industry.

The independent variables are quantitatively continuous, so we can use the multiple linear regression. In order to identify the relation between the turnover - the number of entities, the number of employees, the payroll expenses, the net investments realized, the average gross salary and labor productivity, we used the multiple regression model, taking into consideration the fact that it can be a lot more realistic than the uni-factorial regression model. The threshold of materiality established is of 5%.

As a strategy of choosing the best model we used the method of all possible regressions, the grouping of predictors being made in a descending way, as it follows:

- starting from the maximum model which contains all 6 independent variables and verifying the accuracy of the model; if the model does not correspond, we pass to the next step;
- we analyze all models, depending on the determination coefficient, the signification of the model entirely and the signification of the independent variables and we choose the most viable model. If none of the models corresponds, we move to the next step with identifying all models with 4 independent variables, this procedure being followed until finding the correct model.

The advantage of this strategy is the fact that all variables have equal chances to be included in the model, determining their importance, and, on the other hand, the variable don't stay permanently in the model, they are gradually excluded, verifying their importance in all possible combinations for the number of variables of the model.

The aim of the research demands the clarification of the following research questions:

- What are the characteristics of the variables analyzed?

- Is there a significant effect of the considered variables on the turnover?
- What side from the variation of the turnover is explained by the independent variables?

3. The analysis of the particularities of the evolution of the researched indicators

In order to analyze the correlation between the turnover - the number of entities, the number of employees, the payroll expenses, the net investments realized, the average gross salary and labor productivity, we tried to identify the particularities of the evolution of each indicator, in the period 2004-2013, using Eviews program.

The information regarding the analyzed indicators, for the period 2004-2013 are presented in table 1.

Table 1. The main analyzed indicators from the footwear industry in the period 2004-2013

	Turnover (lei)	Number of entities	Number of employees	Payroll expenses (lei)	The net investments realized (lei)	The average gross salary (lei)	Labor productivity (number of pairs / employee)
2004	2.560.545.075	1.594	99.006	572.479.851	153.231.060	511	754
2005	2.548.949.416	1.629	90.544	609.808.625	149.506.213	598	801
2006	2.931.007.326	1.625	86.707	678.697.794	286.283.672	656	795
2007	3.067.062.649	1.624	78.079	745.162.769	156.712.379	802	836
2008	3.058.665.151	1.532	64.726	742.535.276	138.624.849	973	821
2009	2.910.235.794	1.382	53.239	661.690.663	67.775.632	1.113	759
2010	3.330.360.342	1.231	51.343	666.482.575	93.459.147	1.188	882
2011	3.975.012.016	1.167	56.313	793.853.363	120.317.179	1.281	815
2012	3.952.783.379	1.196	54.302	846.616.293	76.506.361	1.340	882
2013	4.138.309.513	1.207	53.046	873.121.315	101.248.720	1.424	938

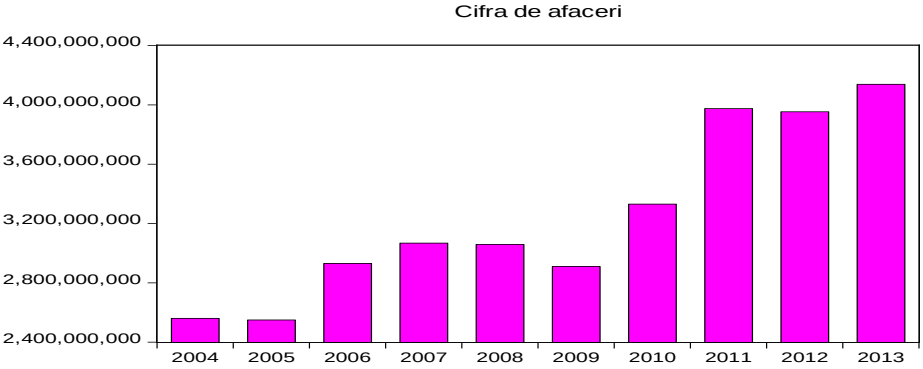
Source: Self processing after the *Romanian Statistical Yearbook* (https://statistici.insse.ro/, 2016)

A. The analysis of the turnover

The evolution of the turnover from the Romanian footwear industry, in the period 2004-2013, is presented in figure 1. As it can be seen, the evolution of the turnover has been a positive one, the only relevant decrease

taking place in 2009; a decrease of 4,85% compared to 2008, which is due to the economic crisis. Minor decreases took place in 2005, 2008 and 2012 too: 0,45%, 0,27% and 0,56% compared to the previous year. Significant increases of the turnover have been achieved in 2006, 2010 and 2011, these increases presenting a positive evolution of 14,99%, 14,44% and 19,36% compared to the previous year.

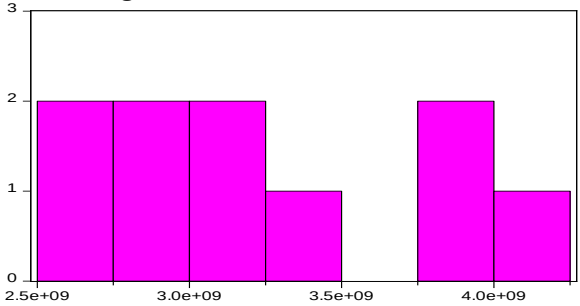
Figure 1. The evolution of the turnover from the footwear industry in the period 2004-2013



The statistic tests made on the turnover from the Romanian footwear industry are presented in figure 2. It can be seen that, in the analyzed period, the average value of the turnover is of 3.247.293.066 lei, the indicator ranging from the minimum of 2.548.949.416 in 2005 to the maximum of 4.138.309.513 lei in 2013.

Analyzing the values obtained after the statistic tests made on the turnover, we can say that the distribution of the turnover in the period 2004-2013 is not perfectly symmetrical the value of the Skewness test being different from zero, this distribution being platykurtic (the value of the Kurtosis test is < 3). It can also be seen that the values between the minimum and the average of the turnover (2004, 2005, 2006, 2007, 2008, 2009) are more numerous than the values between the average and the maximum of the turnover 2010, 2011, 2012, 2013).

Figure 2. Statistic tests made on the turnover in period 2004-2013



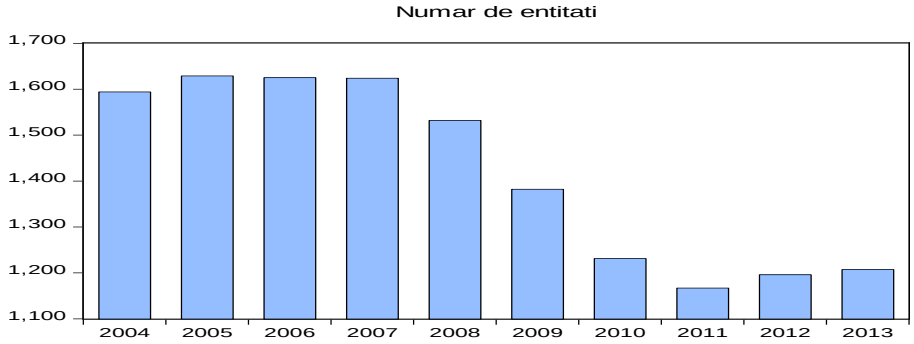
Series: CIFRA_DE_AFACERI	
Sample 2004 2013	
Observations 10	
Mean	3.25e+09
Median	3.06e+09
Maximum	4.14e+09
Minimum	2.55e+09
Std. Dev.	5.84e+08
Skewness	0.410239
Kurtosis	1.745332
Jarque-Bera	0.936407
Probability	0.626126

B. The analysis of the number of entities

The evolution of the number of entities from the Romanian footwear industry, between 2004-2013, is presented in figure 3. As it can be seen, the evolution of the number of entities has been a negative one, a significant increase taking place in 2012, of 2,49% compared to 2011, due to the economic recovery. Minor decreases took place in 2008, 2009, 2010 and 2011, the number of entities dropping by 5,67%, 9,79%, 10, 93% and 5,20% compared to the previous year. Increases of the number of entities took place in 2005 and 2013, these increases representing a positive evolution of 2,20% and 0.92% compared to the previous year.

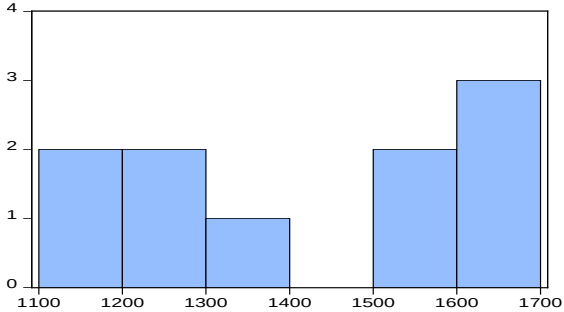
The statistic tests made on the number of entities from the Romanian footwear industry are presented in figure 4. It can be seen that, in the analyzed period, the average value of the number of entities is of 1.418, the indicator ranging between a minimum of 1.167 entities in 2011 and a maximum of 1.629 entities in 2005.

Figure 3. The evolution of the number of entities from the footwear industry between 2004-2013



Analyzing the values from Skewness and Kurtosis tests, we can say that the distribution of the number of entities between 2004-2013 is not perfectly symmetrical, this distribution being platykurtic.

Figure 4. The statistic tests made on the number of entities between 2004-2013



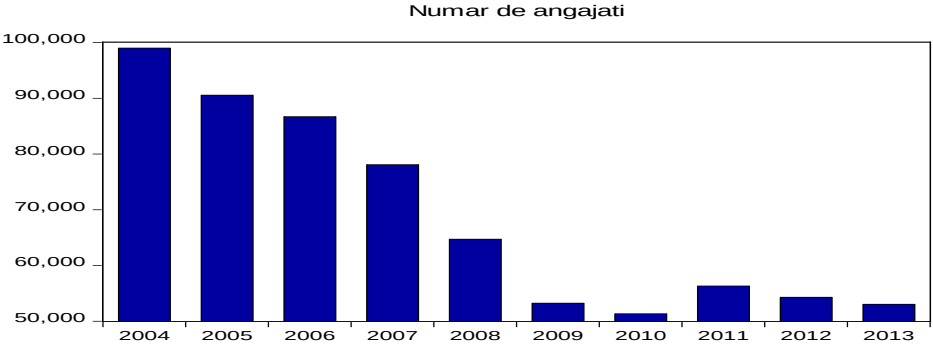
Series: NUMAR_DE_ENTITATI	
Sample 2004 2013	
Observations 10	
Mean	1418.700
Median	1457.000
Maximum	1629.000
Minimum	1167.000
Std. Dev.	201.8922
Skewness	-0.136142
Kurtosis	1.217002
Jarque-Bera	1.355509
Probability	0.507756

C. The analysis of the number of employees

The evolution of the number of employees from the Romanian footwear industry, in the period 2004-2013, is presented in figure 5. The evolution of of the number of employees has been a negative one, the only increase taking place in 2011, of 9,68% compared to 2010, due to the economic recovery. Significant decreases took place in 2005, 2006, 2008, 2009,2010, 2012 and 2013, the number of employees dropping by 8,55%,

4,24%, 9, 95%, 17,11%, 17,75%, 3,56%, 3,57% and 2,31% compared to the previous year.

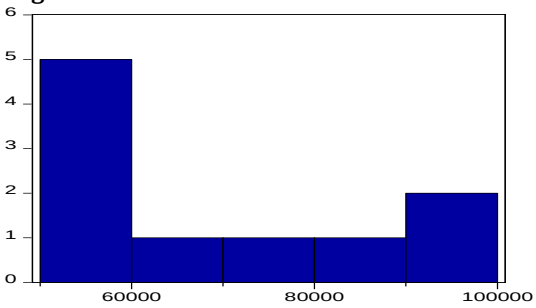
Figure 5. The evolution of the number of employees from footwear industry between 2004-2013



The statistic tests made on the number of employees from the Romanian footwear industry are presented in figure 6. It can be seen that, in the analyzed period of time, the average value of the number of employees is of 68.730, the indicator ranging from a minimum of 51.343 employees in 2010 to a maximum of 99.006 employees in 2004.

Analyzing the values from Skewness and Kurtosis tests, it results that the distribution of the number of employees in the period 2004-2013 is not perfectly symmetrical, this distribution being platykurtic; the values between the minimum and the average of the number of employees are more numerous than the values between the average and the maximum of the indicator.

Figure 6. The statistic tests made on the number of employees between 2004-2013

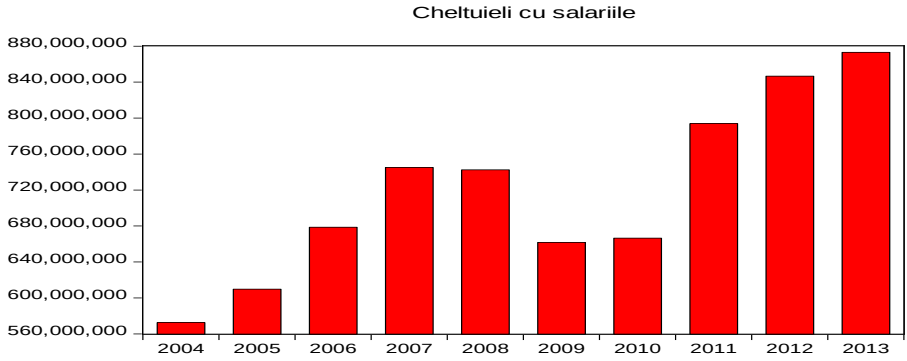


Series: NUMAR_DE_ANGAJATI	
Sample 2004 2013	
Observations 10	
Mean	68730.50
Median	60519.50
Maximum	99006.00
Minimum	51343.00
Std. Dev.	18165.02
Skewness	0.526429
Kurtosis	1.650414
Jarque-Bera	1.220788
Probability	0.543137

D. The analysis of the payroll expenses

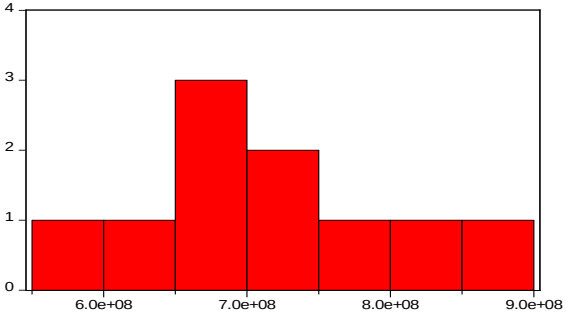
The evolution of the payroll expenses from the Romanian footwear industry, in the period 2004-2013, is represented in figure 7. As it can be seen, the evolution of the turnover was a positive one, the only significant decrease taking place in 2009 of 10,89% compared to 2008 due to the economic crisis. Another significant decrease took place in 2008 of 0,35% compared to 2007, when the economic crisis started. In the rest of the analyzed period the payroll expenses have increased compared to the previous year as it follows: 6,52% in 2005, 11,30% in 2006, 9,79% in 2007, 0.72% in 2010, 19,11% in 2011, 6,65% in 2012 and 3,13% in 2013.

Figure 7. The evolution of the payroll expenses from the footwear industry between 2004-2013



The statistic tests made on the payroll expenses from the Romanian footwear industry are presented in figure 8. It can be seen that, in the analyzed period, the average value of the payroll expenses is of 719.044.852 lei, the indicator ranging from a minimum of 572.479.851 lei in 2004 to a maximum of 873.121.315 lei in 2013.

Figure 8. Statistic tests made on payroll expenses between 2004-2013



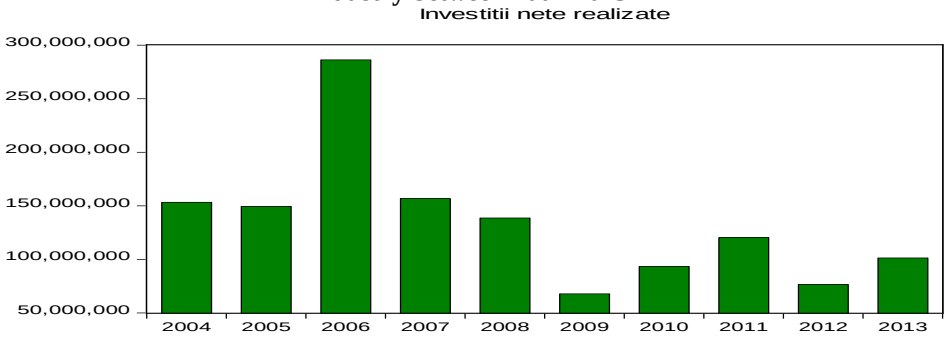
Series: CHELTUIELI_CU_SALARIILE	
Sample 2004 2013	
Observations 10	
Mean	7.19e+08
Median	7.11e+08
Maximum	8.73e+08
Minimum	5.72e+08
Std. Dev.	98847988
Skewness	0.161506
Kurtosis	1.920886
Jarque-Bera	0.528677
Probability	0.767714

Analyzing the values from the Skewness and Kurtosis tests, it results that the distribution of the payroll expenses between 2004-2013 is not perfectly symmetrical, being platykurtic. It can be seen that the distribution is leaning to the left, having more extreme values towards the right (Skewness > 0).

E. The analysis of the net investments realized

The evolution of the net investments realized from the Romanian footwear industry, in the period 2004-2013, is presented in figure 9. The evolution of the net investments realized was both positive and negative, the highest increase taking place in 2006 of 91,49% compared to 2005, due to the preparations of the footwear industry to become competitive when Romania joined the European Union, and the highest decrease took place in 2009 of 51,11%, due to the economic crisis. Significant decreases took place in 2005, 2007, 2008 and 2012 too, the net investments realized decreasing by 2,43%, 45,26%, 11, 54%, and 36,41% compared to the previous year. Significant increases took place in 2010, 2011 and 2013 too, the net investments realized increasing by 37,89%, 28,74% and 32,34% compared to the previous year.

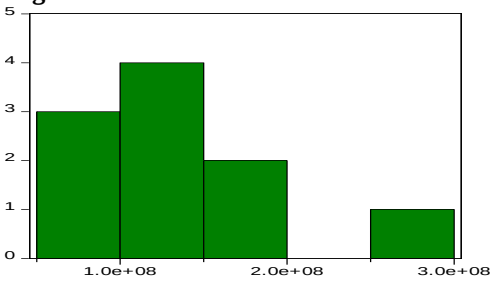
Figure 9. The evolution of the net investments realized from the footwear industry between 2004-2013



The statistic tests made on the net investments realized from the Romanian footwear industry are presented in figure 10. In the analyzed period, the average value of the net investments realized is of 134.366.521 lei, the indicator ranging from a minimum of 67.775.632 lei in 2009 and a maximum of 286.283.672 lei in 2006.

Analyzing the values from the Skewness and Kurtosis tests, it results that the distribution of the net investments realized between 2004-2013 is not perfectly symmetrical, the distribution being platykurtic (Kurtosis > 3).

Figure 10. Statistic tests made on the net investments realized between 2004-2013

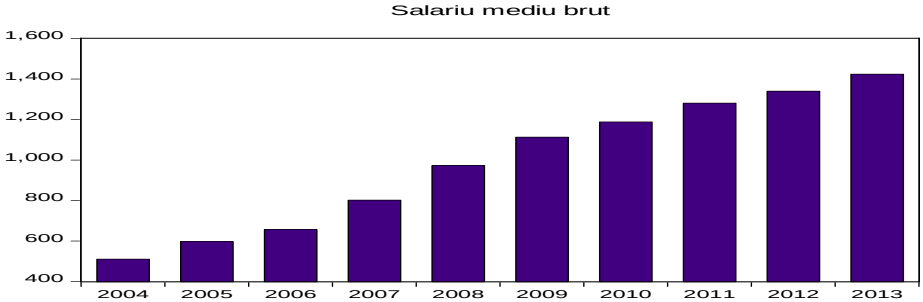


Series: INVESTITII_NETE_REALIZAT	
Sample 2004 2013	
Observations 10	
Mean	1.34e+08
Median	1.29e+08
Maximum	2.86e+08
Minimum	67775632
Std. Dev.	62299548
Skewness	1.419676
Kurtosis	4.654832
Jarque-Bera	4.500162
Probability	0.105391

F. The analysis of the average gross salary

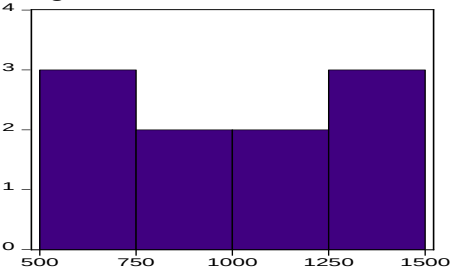
The evolution of the average gross salary from the Romanian footwear industry, in the period 2004-2013, is presented in figure 11.

Figure 11. The evolution of the average gross salary from the footwear industry between 2004-2013



As it can be seen, the average gross salary in the footwear industry has continuously increased, the most important increase taking place in 2007 of 22.26% compared to 2006, due to the increase of exports in the European Union, once Romania joined the European community. Significant increases of the average gross salary took place along the entire analyzed period, as it follows: 17,03% in 2005, 9,70% in 2006, 21,32% in 2008, 14,39% in 2009, 6,74% in 2010, 7,83% in 2011, 4,61% in 2012 and 6,27% in 2013.

Figure 12. Statistic tests made on the average gross salary between 2004-2013



Series: SALARIU_MEDIU_BRUT	
Sample 2004 2013	
Observations 10	
Mean	988.6000
Median	1043.000
Maximum	1424.000
Minimum	511.0000
Std. Dev.	330.0075
Skewness	-0.166346
Kurtosis	1.551744
Jarque-Bera	0.920054
Probability	0.631267

The statistic tests made on the average gross salary from the Romanian footwear industry are presented in figure 12. It can be seen that, in the analyzed period, the value of the average gross salary is of 988,6 lei, the indicator ranging from a minimum of 511 lei in 2004 to a maximum of 1.424 lei in 2013.

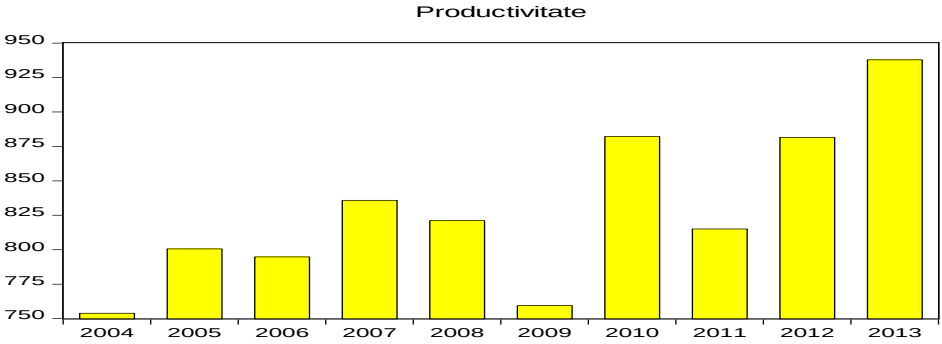
Analyzing the values from the Skewness and Kurtosis tests, it results that the distribution of the average gross salary between 2004-2013 is not

perfectly symmetrical, the distribution being platykurtic, leaning to the right, having more extreme values towards left (Skewness < 0).

G. The analysis of labor productivity

The evolution of labor productivity from the Romanian footwear industry, in the period 2004-2013, is presented in figure 13. The evolution of labor productivity has been both positive and negative the highest increase taking place in 2010 of 16,16% compared to 2009, due to the increase of the market competitiveness determined by the economic crisis, and the highest decrease took place in 2011 of 7,60% due to the resumption of consumption. Significant increases took place in 2005, 2007, 2012 and 2013 too, the labor productivity increasing by 6,19%, 5,18%, 8,16% and 6,38% compared to the previous year. Significant decreases took place in 2006, 2008 and 2009 too, the labor productivity decreasing by 0,73%, 1,77% and 7,51% compared to the previous year.

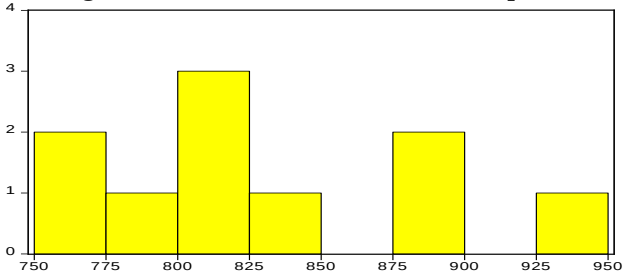
Figura 13. The evolution of labor productivity from the footwear industry between 2004-2013



The statistic tests made on labor productivity from the Romanian footwear industry are presented in figure 14. It can be seen that, in the analyzed period, the average value of the labor productivity is of 828 pairs/employee, the indicator ranging from a minimum of 754 pairs/employee in 2004 to a maximum of 938 pairs/employee in 2013.

Analyzing the values from the Skewness and Kurtosis tests, it results that the distribution of the labor productivity in the period 2004-2013 is not perfectly symmetrical, the distribution being platykurtic, leaning to the left.

Figure 14. Statistic tests made on labor productivity between 2004-2013



4. The regression model

In order to correctly specify the multi-factorial regression model which to determine if there is a significant effect of the considered variables on the turnover from the footwear industry, we analyzed 19 equations, combining the considered variables as it follows:

- an equation with all the defined variables, including the 6 analyzed independent variables (NE, NA, CS, INR, SMB, PM);
- 6 equations, each of them including 5 of the 6 defined independent variables;
- 12 equations, each of them including 4 of the 6 defined independent variables;

The analysis of the regression model that contains all independent variables is presented in table 2.

Table 2. Statistical tests made on the regression model with 6 independent variables

	E1
Multiple R	0,998027027
R Square	0,996057946
Ajusted R Squared	0,988173837
F	126,3374238
Significance F	0,001077719
P-value	
Intercept	0,217062267
NE	0,048706671

NA	**0,692634997**
CS	0,043049522
INR	**0,167386372**
SMB	**0,86341111**
PM	**0,534911566**

Source: Author's self processing using *Excel/Data Analysis*

The maximum model has the following structure:

$$Y = c(1) + c(2)*X_1 + c(3)*X_2 + c(4)*X_3 + c(5)*X_4 + c(6)*X_5 + c(7)*X_6.$$

After statistical processing the model that includes all independent variables is:

$$CA = 3.081.219.270 - 2.169.114,047*NE + 4.355,569*NA + 3,708*CS + 1,102*INR - 222.113,383*SMB + 421.475,409*PM$$

Analyzing the data obtained we can say that 98,82% from the turnover variation is explained by the independent variables included in the model (Adjusted R Squared). Although the determination coefficient shows us how much of the variation of the dependent variable is explained by the independent variables included in the model, it increases with the number of independent variables from the model, so it is more relevant to take into consideration Adjusted R Squared.

For the general testing of the model E1, we observe that Significance F is smaller that the fixed materiality threshold (0,001 <0,05), and comparing $F_{calculated} = 126,33$ with $F_{\propto;\, k;\, n-k-1} = F_{0,05;\, 6;\, 3} = 8,94$, (where α is the fixed confidence interval, *k* is the number of independent variables included in the model and *n* is the number of observations), we obtain $F_{calculated} > F_{0,05;\, 6;\, 3}$, so the null hypothesis is rejected in the favor of the alternative hypothesis, so the model is significant.

We showed that the regression equation E1 is significant globally, but, as it can be seen in table 2, for the independent variables number of employees, net investments realized, average gross salary and labor productivity, P-value> 0,05 (the chosen materiality threshold), we can't reject the null hypothesis, these variables being insignificant in the model.

After analyzing the results obtained within the model with 6 independent variables, we move on to the model with 5 possible variables, all the possible regression equations being presented in table 3.

The model with 5 independent variables has the following structure:

$$Y = c(1) + c(2)*X_1 + c(3)*X_2 + c(4)*X_3 + c(5)*X_4 + c(6)*X_5$$

Analyzing the results obtained for the 6 possible equations (E2-E7), it can be seen that, for all the models the null hypothesis is rejected, so the models are significant globally.

Although they are significant globally, in each one of the 6 models with 5 independent variables, there are insignificant independent variables (for which the null hypothesis can't be rejected), as it follows:

- for E2: NA, INR and SMB;
- for E3: NA, INR and PM;
- for E4: NA, SMB and PM;
- for E5:NA, INR and PM;
- for E6: INR, SMB and PM;
- for E7: CS, INR and PM.

Table 3. Statistical tests made on the regression models with 5 independent variables

	E2	E3	E4	E5	E6	E7
Multiple R	0,9977	0,998	0,9958	0,9904	0,9979	0,9912
R Square	0,9954	0,996	0,9917	0,981	0,9958	0,9825
Ajusted R Squared	0,9896	0,991	0,9814	0,9573	0,9906	0,9605
F	173,72214	199,79535	96,00456	41,38159	190,07325	44,8142
Significance F	0,0000915	0,0000693	0,0002963	0,0015439	0,0000765	0,0013222
P-value						
Intercept	0,1831676	0,0045462	0,1018162	0,1716158	0,0035584	0,04226261
NE	0,0282468	0,0004710	0,0242219	**0,7846274**	0,0013982	-
NA	**0,5206922**	**0,0543354**	**0,7750671**	0,0204470	-	0,026353
CS	0,0232801	0,0004389	0,0119690	-	0,0009353	**0,5532223**
INR	**0,1077067**	**0,0598955**	-	**0,0695051**	**0,1137914**	**0,1245961**
SMB	**0,992039**	-	**0,3350834**	0,0103971	**0,0605276**	0,0095115
PM	-	**0,4825967**	**0,4864623**	**0,8259129**	**0,3928154**	**0,9934441**

Source: Author's self processing using *Excel/Data Analysis*

According to the proposed methodology, because the results for the model with 5 independent variables are not satisfying, we move on to the model with 4 independent variables, with the following structure:

$$Y = c(1) + c(2)*X_1 + c(3)*X_2 + c(4)*X_3 + c(5)*X_4$$

For this type of model, there are 12 possible equations and they are presented in table 4 and table 5.

Table 4. Statistical tests made on the regression models with 4 independent variables

	E8	E9	E10	E11	E12	E13
Multiple R	0,9977	0,9953	0,9946	0,9396	0,9903	0,9758
R Square	0,9954	0,9905	0,9893	0,8828	0,9808	0,9523
Ajusted R Squared	0,9917	0,9829	0,9807	0,789	0,9654	0,9141
F	271,43316	130,66453	115,13074	9,4122	63,76287	24,94621
Significance F	0,0000049	0,0000303	0,0000415	0,0150919	0,0001769	0,0016814
P-value						
Intercept	0,0002873	0,0805755	0,0162937	0,1919097	0,1216013	0,1848538
NE	0,0000989	0,015503	0,0009744	**0,0579944**	**0,8064745**	**0,8921454**
NA	0,0363966	**0,9039875**	0,0406651	**0,8850618**	0,0051362	0,0281568
CS	0,0000323	0,0060079	0,0004672	-	-	-
INR	0,0426640	-	-	**0,2814115**	0,038706	-
SMB	-	**0,3741105**	-	-	0,0012014	0,0215689
PM	-	-	**0,6377918**	**0,1459236**	-	**0,7251729**

Source: Author's self processing using *Excel/Data Analysis*

Table 5. Statistical tests made on the regression models with 4 independent variables

	E14	E15	E16	E17	E18	E19
Multiple R	0,9974	0,9944	0,9912	0,9417	0,9828	0,9903
R Square	0,9948	0,9888	0,9825	0,8868	0,966	0,9806
Ajusted R Squared	0,9907	0,9798	0,9684	0,7962	0,9388	0,9651
F	241,43733	110,02529	70,02083	9,79229	35,49928	63,28084
Significance F	0,0000066	0,0000464	0,0001407	0,01387	0,0007286	0,0001802
P-value						
Intercept	0,000593	0,0104111	0,0154923	0,9528901	0,0826328	0,0142035
NE	0,000487	0,0007923	-	-	-	-
NA	-	-	0,0111906	**0,4483247**	0,0496525	0,0055407
CS	0,000181	0,0009883	**0,4900103**	**0,0526607**	**0,2123126**	-
INR	**0,0948818**	0,0459442	**0,0820446**	**0,9683061**	-	0,0420643
SMB	0,0499685	-	0,002954	-	0,0189891	0,0005397
PM	-	**0,594055**	-	**0,6166983**	**0,9308937**	**0,8711291**

Source: Author's self processing using *Excel/Data Analysis*

Analyzing the results obtained for the 12 possible equations (E8-E19), it can be seen that, for all the models the null hypothesis is rejected, so the models are significant globally.

We analyzed, for each model, if the independent variables are significant and the data obtained do not allow identifying the need of the following variables in the model:

- for E8: –
- for E9: NA and SMB;
- for E10: PM;
- for E11: NE, NA, INR and PM;
- for E12: NE ;
- for E13: NE and PM;
- for E14: INR;
- for E15: PM;
- for E16: CS and INR;
- for E17: NA, CS, INR and PM;
- for E18: NA, CS and PM;
- for E19: PM.

It can be seen that for the model E8, the testing of each coefficient led to the rejection of the null hypothesis, so all the variables are significant in the model. The model can be written as it follows:

CA = 2.976.022.124 – 2.075.146,111*NE + 6.215,463*NA + 3,661*CS + 1,158*INR

The results obtained after applying the statistical tests on the multiple regression model, using Eviews program, are presented in figure 15.

Dependent Variable: CIFRA DE AFACERI
Method: Least Squares (Gauss-Newton / Marquardt steps)
Sample: 2004 2013
Included observations: 10
CIFRA DE AFACERI=C(1)+C(2)*NUMAR DE ENTITATI+C(3)
*NUMAR_DE_ANGAJATI+C(4)*CHELTUIELI_CU_SALARIILE+C(5)
*INVESTITII_NETE_REALIZAT

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2.98E+09	3.32E+08	8.968960	0.0003
C(2)	-2075144.	185243.7	-11.20224	0.0001
C(3)	6215.454	2191.296	2.836428	0.0364
C(4)	3.661077	0.259793	14.09227	0.0000
C(5)	1.158104	0.428562	2.702304	0.0427

R-squared	0.995416	Mean dependent var	3.25E+09
Adjusted R-squared	0.991748	S.D. dependent var	5.84E+08
S.E. of regression	53046251	Akaike info criterion	38.71808
Sum squared resid	1.41E+16	Schwarz criterion	38.86937
Log likelihood	-188.5904	Hannan-Quinn criter.	38.55211
Durbin-Watson stat	2.762903		

Figure 15. Statistical tests on the multi-factorial regression model

Using Eviews program we tested the auto-correlation of the quadratic errors of the regression equation (figure 16). Because there isn't any auto-correlation of the quadratic errors, it results that we don't have any clues of the existence of the heteroskedasticity.

Sample: 2004 2013
Included observations: 10

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.301	-0.301	1.2076	0.272
		2	-0.072	-0.179	1.2849	0.526
		3	-0.112	-0.217	1.4989	0.683
		4	-0.130	-0.307	1.8385	0.765
		5	0.439	0.296	6.4642	0.264
		6	-0.158	0.035	7.2092	0.302
		7	-0.081	-0.082	7.4732	0.381
		8	-0.134	-0.153	8.5535	0.381
		9	0.049	0.022	8.8389	0.452

Figure 16. Statistical tests on the multi-factorial regression model

The stability tests of the equations and estimated coefficients are presented in figure 17 and figure 18. As it can be seen, the parameters of the equation can be considered to be stable, because the cumulative sum of the recursive errors doesn't exceed the area of the two critical lines.

Figure 17. CUSUM tests on the regression equation

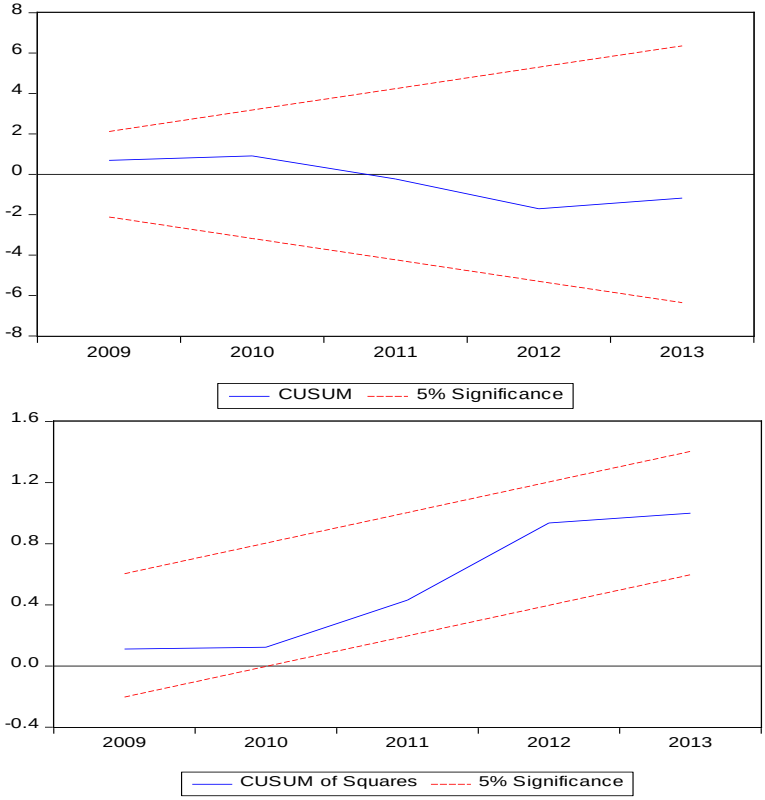
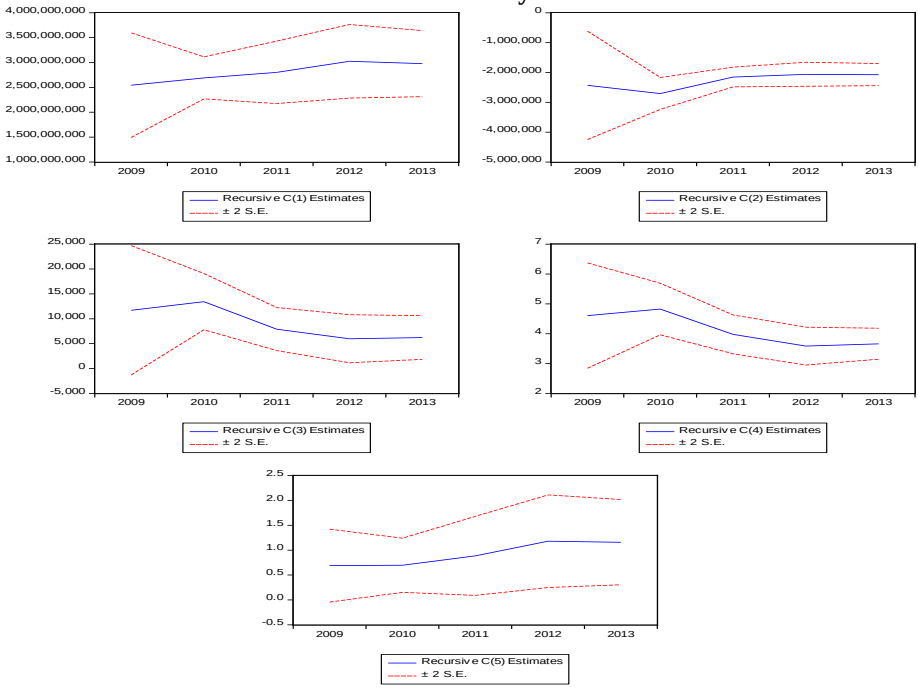


Figure 18. Testing of the coefficients of the regression equations calculated recursively



In order to determine the multicollinearity we used the Klein test. According to the data presented in table 6, the simple correlation coefficients are smaller than the multiple determination coefficient ($r_{12}, r_{13}, r_{14}, r_{15}, r_{23}, r_{24}, r_{25}, r_{34}, r_{35}, r_{45} < R^2$), so, according to the Klein test, we can say that there isn't any multicollinearity between the independent variables.

Table 6. The correlations of the independent variables from the regression model

	CA	NE	NA	CS	INR
CA	1				
NE	-0,86987	1			

NA	-0,75473	0,86529	1		
CS	0,91865	-0,65059	-0,66702	1	
INR	-0,42120	0,67541	0,69669	-0,31449	1

Source: Author's self processing using *Excel/Data Analysis*

5. Conclusions

The aim of the research was to identify a multiple regression model which to contain as may independent variables from the ones taken into consideration so that they explain the change of the turnover of the Romanian footwear industry. The identified multiple regression model has the following independent variables: the number of entities, the number of employees, the payroll expenses, the net investments realized, the average gross salary and labor productivity.

The validation of the regression model took into consideration the fact that, the multiple determination coefficient (Multiple R) but also Adjusted R Squared are large, having values close to 1, which means that the considered independent variables explain in more than 99% the variation of the turnover. The value of the statistical test F is high, and Significance F is low, which means that the multiple regression model is proper, all the coefficients are no equal to zero and the regressors are present in the model. Analyzing the information regarding t Stat and P-value, we can say that for all the independent variables included in the model the null hypothesis is rejected.

The testing of the multicollinearity, using the Klein test, has revealed the fact that there isn't any multicollinearity between the independent variables of the model. The stability tests of the model and of the estimated coefficients have determined that the parameters of the equation are stable.

As a conclusion, we can say that the model is correct. After estimating the regression model, it can be seen a positive influence of the number of employees, payroll expenses and of the net investments realized on the turnover, and a negative influence of the number of entities. This is explained by the fact that even though the number of entities has decreased, the turnover has increased, because the competitiveness of the entities from the Romanian footwear industry has increased too.

Even though the micro-entities and small entities (between 1-49 employees) represented, in 2013 79,62% from the total of entities activating in the footwear industry, and the middle-sized and large entities (over 50

employees) represented 20,38%, the share of the turnover realized by the micro-entities and small entities in the turnover total was of 18,64%, and the one of the middle-sized and large entities was of 81,36%. So, even if the number of entities from the footwear industry has decreased in this period by 24,28%, the turnover has increased by 61,62%.

6. References

- Anghelache, C.; Manole, A.; Anghel, M. G. (2015) Analysis of final consumption and gross investment influence on GDP–multiple linear regression model. Theoretical and Applied Economics, 22.3 (604), p. 137-142.
- Chatterjee, S.; Hadi, A. S. (2015) Regression analysis by example. John Wiley & Sons.
- Ismail, M. B. M. (2016) Factors Affecting Competitive Rivalry of Rice Shop Owners: multiple regression analysis. Journal of Management, 9(1), p. 49-57.
- Kabacoff, R. (2015) R in action: data analysis and graphics with R. Manning Publications Co.
- Montgomery, D. C.; Peck, E. A.; Vining, G. G. (2015) Introduction to linear regression analysis. John Wiley & Sons.
- Moy, R. L.; Chen, L. S.; Kao, L. J. (2015) Multiple Linear Regression. Study Guide for Statistics for Business and Financial Economics, Springer International Publishing, p. 223-240.
- INSSE - Statistical DB - TEMPO-Online time series, https://statistici.insse.ro/shop/