The Evolution of the Turnover From the Point of View of the Number of Employees, the Net Realized Investments and the Average Gross Salary in the Romanian Footwear Industry

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Abstract

The turnover of the Romanian footwear industry had an ascending evolution going up to 4.138.309.513 lei in 2013 compared to 2.560.545.075 in 2004 (an increase of 61,62%). Maintaining this positive evolution depends also on knowing and uderstanding the factors that influence the turnover, some of them being the number of employees, the net realized investment and the average gross salary.

The aim of this article is to determine an econometrical model between the turnover (dependent variable) and the number of employees, the net realized investment and the average gross salary (independent variables) in the Romanian footwear industry in the period 2004-2013.

Key words: turnover, multiple regression, model of analysis
J.E.L. classification: C50, D78

1. Introduction

The Romanian footwear industry represents an important component of the manufacturing industry, which has also proven its competitiveness after our country joined the European Union by the increase of the turnover and if the exports.

Even though the turnover had an ascending trend, the number of employees in the Romanian footwear industry had a descending trend due to the need of increasing the competitiveness by increasing the labor productivity. The characteristic of this industry is the fact that it doesn't need large investments for technology, and in Romania the cost of labor is, except Bulgaria, the lowest in the European Union. These aspects determined us to make a research of the Romanian footwear industry regarding the way the turnover is influenced by the number of employees, the net realized investment and the average gross salary.

The aim of the research was to determine a multiple linear regression model which can be used to visualize the influence of the number of employees, the net realized investment and the average gross salary on the turnover in the Romanian footwear industry in the period 2004-2013, using the national statistical data provided by the National Statistical Institute on its website: http://statistici.insse.ro/shop/?lang=ro.

Regarding the research methodology we mention the following:

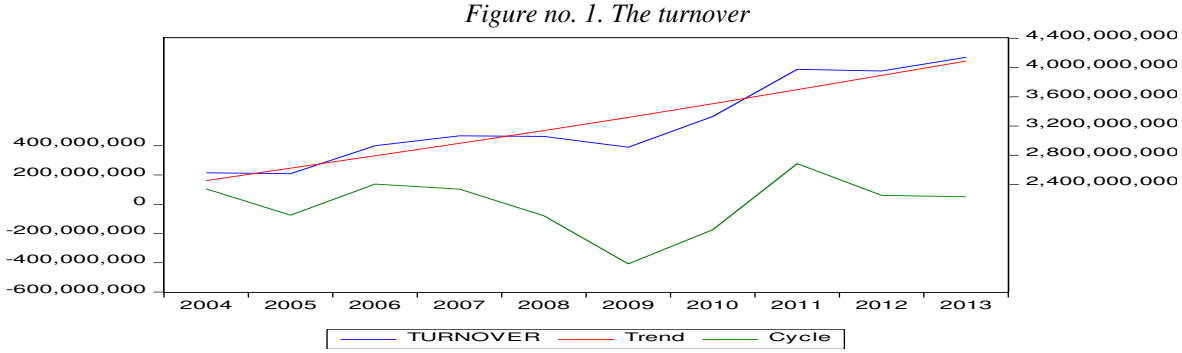
- the dependent variable is the turnover and the independent variables are number of employees (NE), net realized investment (NRI) and the average gross salary (AGS);
- we established a threshold of significance of 0.05;
- for verifying the statistical hypotheses we used the White test, the Durbin-Watson test, the LM Breusch-Godfrey test, Jarque-Berra test and the Klein test with EViews program.

2. The situation of the main indicators of the Romanian footwear industry

The analyzed indicators from the footwear industry have recorded favorable evolutions except for the net realized investments, which has decreased during the analyzed period.

The turnover of the Romanian footwear industry (figure no. 1) presents an obvious increase during the analyzed period, recording insignificant decreases in 2005, 2008, 2009 and 2012. If in 2005, the decrease of the turnover was determined by circumstantially factors, the decrease from 2008 and 2009 was mainly due to the world economic crisis and the one from 2012 was due to the existing predictions regarding a new possible crisis. Even if we talked about a decrease of the turnover, due to the fact that this decrease was under 0.6% in 2005, 2008 and 2012, we can say that it was a stagnation of the increase rather than a decrease.

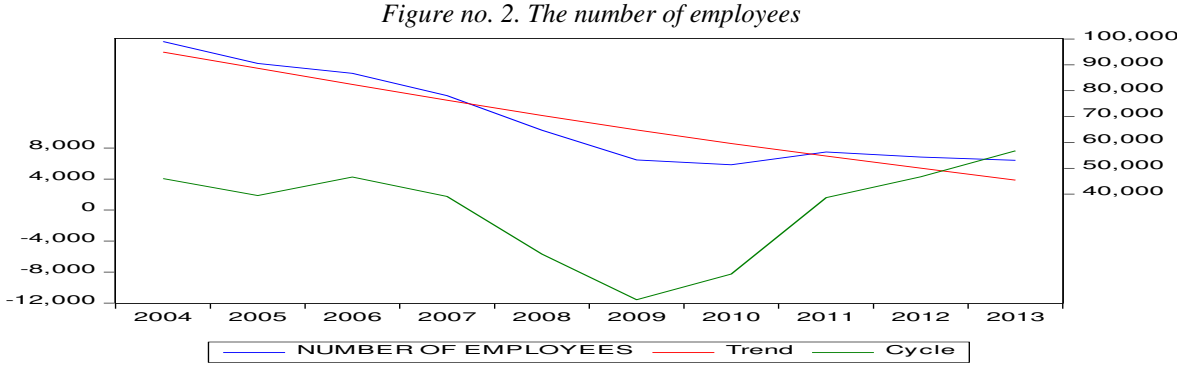
Figure no. 1. The turnover



Source: Author's self processing using *EViews*

The number of employees from the Romanian footwear industry (figure no. 2) decreased in the analyzed period, from 99.006 in 2004, to 53.046 in 2013. The only increase of the number of employees was recorded in 2011, this being explainable after a decrease of 34.2% in the period 2007-2010.

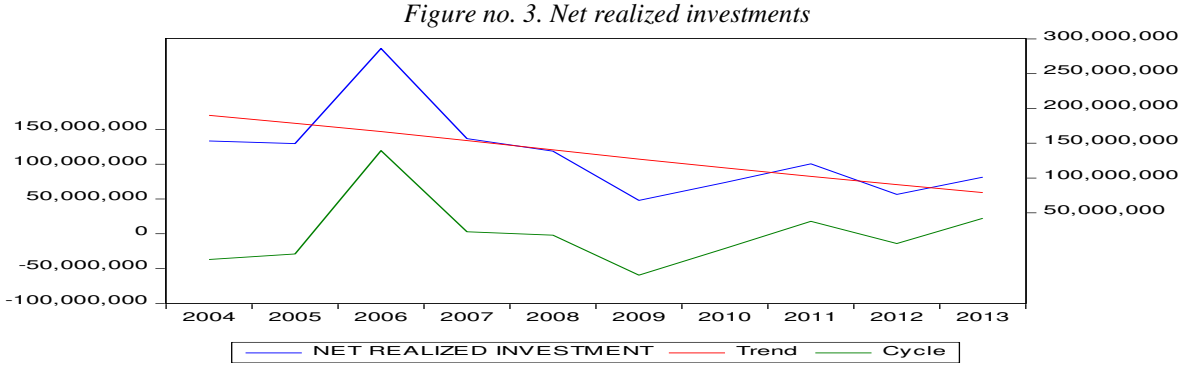
Figure no. 2. The number of employees



Source: Author's self processing using *EViews*

The net realized investments present an acyclic evolution (figure no. 3) with variations from one year to another, but overall, the largest net investments were recorded in 2006 when a refurbishment of the Romanian footwear industry took place with the aim of streghtening its competitiveness, especially because in 2007 Romania joined the European Union, and over 90% of the exports of the industry are made in the community.

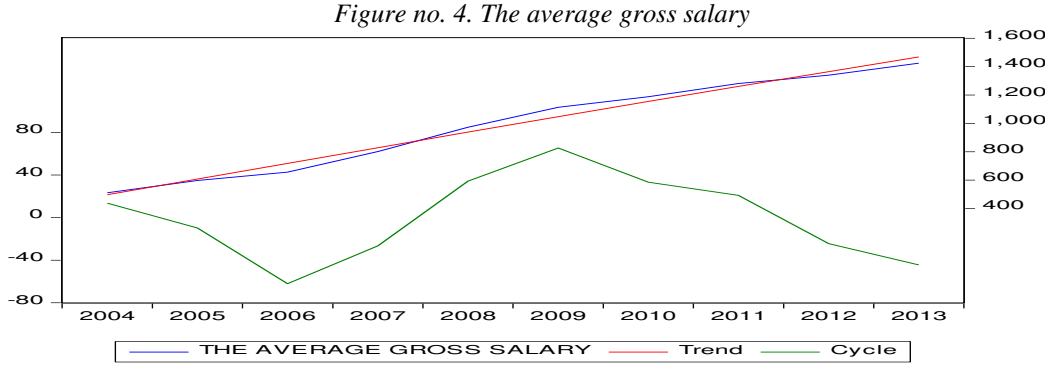
Figure no. 3. Net realized investments



Source: Author's self processing using *Eviews*

The average gross salary has continuously increased during 2004-2013 (figure no. 4), from 511 lei to 1.424 lei, but it's still with an average of 30% lower than the national average gross salary, which shows that in the footwear industry the salaries of the employees should substantially increase.

Figure no. 4. The average gross salary



Source: Author's self processing using *EViews*

3. The regression model

The multifactorial regression model by which we want to determine if, in the footwear industry, the turnover is influenced by the number of employees, net realized investment and the average gross salary has the following structure:

$Y = c(1) + c(2)*X_1 + c(3)*X_2 + c(4)*X_3 + \varepsilon$

We apply the statistical test over this regression model and the obtained results are presented in figure no. 5. It can be seen that over 97% from the variation of the turnover of the Romanian footwear industry is explained by the number of employees, net realized investment and the average gross salary

Figure no. 5. The identified regression model

Dependent Variable: TURNOVER
Method: Least Squares (Gauss-Newton / Marquardt steps)
Included observations: 10
TURNOVER = C(1) + C(2)*NE + C(3)*NRI + C(4)*AGS

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-3.22E+09	7.59E+08	-4.240863	0.0054
C(2)	35575.13	6409.017	5.550794	0.0014
C(3)	2.277279	0.745353	3.055304	0.0224
C(4)	3759527.	343212.7	10.95393	0.0000

R-squared	0.980516	Mean dependent var	3.25E+09
Adjusted R-squared	0.970775	S.D. dependent var	5.84E+08
S.E. of regression	99830822	Akaike info criterion	39.96503
Sum squared resid	5.98E+16	Schwarz criterion	40.08606
Log likelihood	-195.8251	Hannan-Quinn criter.	39.83225
F-statistic	100.6509	Durbin-Watson stat	1.945045
Prob(F-statistic)	0.000016		

Source: Author's self processing using *EViews*

With EViews program we verify the assumption of homoscedasticity using the White test (Andrei et al, 2008, pp. 150-152) (figure no. 6). As it can be seen, the value Obs*R-squared is smaller than the tabled value of $\chi^2_{0,05;4}$ (0,7614 < 9,49). Also, the F-statistic value is smaller than t $F_{0,05;3;6}$ (0,1648 < 4,76) and the estimators of the model are insignificant for the fixed threshold of significance, resulting that the assumption of homoscedasticity is verified (Pecican, 2006, p. 80;

Anglelache et al, 2012, p. 228).

Figure no. 6. The White test

Heteroskedasticity Test: White

F-statistic	0.164831	Prob. F(3,6)	0.9163
Obs*R-squared	0.761406	Prob. Chi-Square(3)	0.8587
Scaled explained SS	0.151472	Prob. Chi-Square(3)	0.9850

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2004 2013
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.62E+15	2.20E+16	0.391688	0.7088
(NE)^2	-600706.6	2333923.	-0.257381	0.8055
(NIR)^2	-0.000750	0.143216	-0.005233	0.9960
(AGS)^2	3.67E+08	9.86E+09	0.037214	0.9715

R-squared	0.076141	Mean dependent var	5.98E+15
Adjusted R-squared	-0.385789	S.D. dependent var	6.63E+15
S.E. of regression	7.80E+15	Akaike info criterion	76.31302
Sum squared resid	3.65E+32	Schwarz criterion	76.43405
Log likelihood	-377.5651	Hannan-Quinn criter.	76.18024
F-statistic	0.164831	Durbin-Watson stat	3.054824
Prob(F-statistic)	0.916252		

Source: Author's self processing using *EViews*

With Eviews program we verify the assumption of independence of the errors using the Durbin-Watson test. For the chosen threshold of significance (0.05), the number of the exogenous variables (3) and the observed values (10) from the Durbin-Watson table we have d_1=0,525 și d_2=2,016. We observe that d_1 < Durbin-Watson stat < d_2 (0,525<1,945<2,016); we are unable to decide so we use LM Breusch-Godfrey test (figure no. 7). We have Obs*R-squared < $\chi^2_{0,05;4}$ (7,657< 9,49), so it can be said that the errors are independent (Pecican, 2006, pp. 82-83).

Figure no 7. The LM Breusch-Godfrey test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	6.537673	Prob. F(2,4)	0.0549
Obs*R-squared	7.657441	Prob. Chi-Square(2)	0.0217

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Sample: 2004 2013
Included observations: 10
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	10321097	4.67E+08	0.022079	0.9834
C(2)	514.2677	3932.573	0.130771	0.9023
C(3)	-0.573728	0.471090	-1.217874	0.2902
C(4)	44863.71	214210.6	0.209437	0.8443
RESID(-1)	-0.325711	0.307338	-1.059779	0.3490
RESID(-2)	-1.115900	0.310600	-3.592721	0.0229

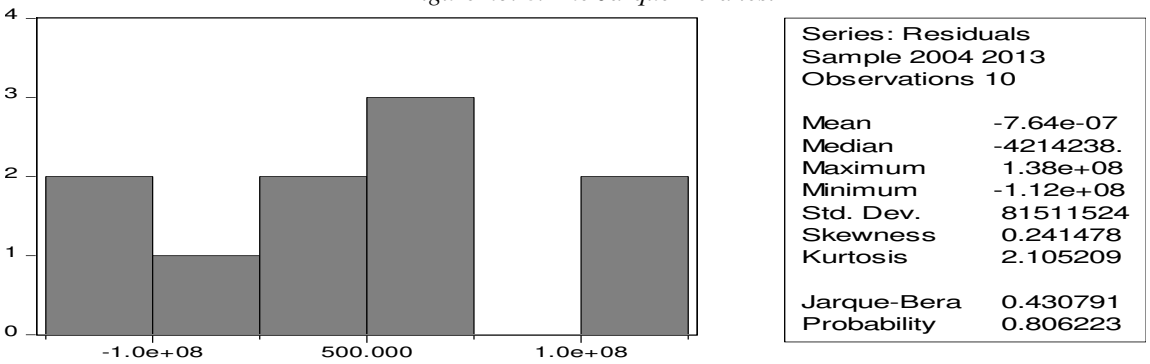
R-squared	0.765744	Mean dependent var	-7.64E-07
Adjusted R-squared	0.472924	S.D. dependent var	81511524
S.E. of regression	59177350	Akaike info criterion	38.91369
Sum squared resid	1.40E+16	Schwarz criterion	39.09524
Log likelihood	-188.5684	Hannan-Quinn criter.	38.71452
F-statistic	2.615069	Durbin-Watson stat	2.481515
Prob(F-statistic)	0.186395		

Source: Author's self processing using *EViews*

With Eviews program we verify the assumption of normality of the values of the residual variable by using the Jarque-Bera test (figure no. 8). The calculated value of the Jarque-Bera test is smaller than the tabled value of $\chi^2_{0,05;2}$ (0,43 < 5,99); the probability that the Jarque-Bera test doesn't exceed the tabled value is big enough (80%) aspects which allow us to conclude that the

assumption of normality of the errors can be accepted.

Figure no. 8. The Jarque-Bera test



Source: Author's self processing using *EViews*

We use the Klein test in order to determine the multicollinearity (table no. 1). Because there aren't any simple correlation coefficients that are bigger than the multiple coefficient of determination (0.98), we can say that there isn't multicollinearity between the variables of the model so the model can be considered viable (Andrei y Spircu, 2009, pp. 116-117).

Table no. 1. The correlations of the variables from the regression model

	Turnover	**Number of employees**	**Net realized investment**	**The average gross salary**
Turnover	1			
Net realized investment	-0,75473	1		
Number of employees	-0,4212	0,696685	1	
The average gross salary	0,902792	-0,95577	-0,67548	1

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

4. Conclusions

After the analysis made within the article we can say that the multifactorial regression model is correct taking into account the following considerations:

- the turnover is mainly explained by the independent variables considered in the model, the multiple correlation coefficient and Adjusted R Squared having large value;
- the multiple regression model is good, the value of the statistic of the F test being large and Significance F is very small;
- for the independent values included in the model the the null hypothesis is rejected;
- there isn't multicollinearity between the variables of the model.

So the multiple regression model that explains the variation of the turnover from the Romanian footwear industry taking into consideration the number of employees, net realized investment and the average gross salary is:

TURNOVER = -3.22E+09 + 35.575,13*NE + 2,277279*NRI + 3.759.527*AGS

5. References

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