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MODEL OF ANALYSIS IN THE ROMANIAN FOOTWEAR INDUSTRY

Case study

Keywords
Simple regression
Correlation
Footwear industry
Exports
Turnover

JEL Classification
C20

Abstract

The aim of this work is to determine the influence that exports of footwear industry have on the turnover of the sector. In the work, a period of 9 years is taken into consideration: from 2004 to 2012, establishing an econometric model of analysis of the connection between the turnover and direct exports of footwear industry in Romania. Based on the analyzed empirical data, the work answers to the following question: what is the influence that exports of footwear industry have on sector's turnover? In addition to specifying the econometric model which describes the connection between the two variables, we also test the validity of the model and the intensity of the connection between the two variables.

1. Introduction

Starting with the 1990s, with the process of opening up to foreign trade and the promotion of international economic integration, it was established an increasingly competitive environment where the entities must develope their activity.This globalization process has substantially affected some traditional industries, like that of the footwear, one of the most globalized which recorded a rapid growth in production and commerce worldwide and a change in the geographical distribution of the origin and distribution of commercial flows.

As part of this major economic globalization, the Romanian industry was threatened by the increasing competitiveness, primarily in the countries of South-East Asia, capable of providing very cheap products at a lower quality.The strong competitive advantage presented by these countries, especially China,is explained by the very low costs of labor force, with which it is hard to compete even for a country like Romania, where wages are much lower than the European average. This competitive advantage allowed these countries to capture a good portion of the market outlets of footwear industry worldwide. This situation has worsened with the entry of China into the World Trade Organization (WTO), when some of the restrictions that were protecting the european industry have been eliminated.

The Romanian footwear industry has a significant recent past, being part of the top footwear exporters and whose share was a quarter of Romania's foreign trade with U.E. Later, amid the appreciation of the exchange rate of the Leu against the Euroand liberalization of the European market by imports from Asia, footwear industry has entered a period of decline. This decline had an impact on former big European countries exporting footwear too, as Spain and Poland.

The footwear industry represents an important sector of national economy, through both its long tradition in export activity, but also as an important employer in the industry.

In this work the aim is to determine a possible connection of direct exports of footwear industry on the turnover of the sector.

2. Research methodology

The method used to respond to the researched question is the analysis of a unifactorial econometric model for time series. The variables chosen for the model are:

Y – the dependent variable: the turnover- expressed by the annual volume of the turnover from footwear industry;

X – the independent variable: exports- expressed by the direct exports of the footwear industry.

The motivation for choosing these variables resides in the importance that Romania has, worldwide, in the countries exporting footwear (Figure no. 1).

For this analysis we have used the data given by the National Institute of Statistics, collected and processed in accordance with Eu methodology, between January 2004 and December 2012 (INSSE).

The objectives of the research are:

- analyzing the existence of possible dependency links between turnover (outcome variable) and the level of direct export (causal variable)in footwear industry;
- building an econometric model to analyze to what extent it can answer the researched question;
- validation of the results by specific tests.

3. Specification of econometric model describing the relationship between the two variables

In order to identify the typology of the regression function, the graphical representation of the relationship between turnover and the level of exports in footwear industry is made (Figure no. 2).

It can be observed that the points distribution (x_i, y_i)can be approximated by a straight line, so we can assume that an econometric model that describes the relationship between the two variables is a linear model, as it follows (Anghelache et al., 2009):

$Y = a + bX + \varepsilon$,

where a and b are model parameters

a – Y intercept (constant term)

b – the slope of regression line

ε – measurement error

By the calculation made using the function of the linear regression model, we obtain the following parameters:

a = 706,52

b = 1,257

The regression function becomes:

$Y = 706,52 + 1,257X$

Based on the data presented in Table No. 1, using Excel / Data Analysis (Omey), we have obtained the following data presented in Table No. 2.

Multiple R is the coefficient of simple correlation between X and Y.

R Square (R^2) is the determination coefficient which shows the validity of the model chosen to explain the variation of Y. The model is well chosen if R Square tends to value 1.

Adjusted R Square is a determination coefficient corrected with freedom degrees having equal significance as R^2.

Standard Error represents the standard error and explains the average deviation the observed values of Y from the theoretical values on the regression line.

Observations represent the number of observations; in this case n = 9 (2004-2012).
ANOVA represents the analysis table.
Degrees freedom (df):

- for Regression k (k = 1, simple regression);
- for Residual n – k – 1 (9 – 1 – 1 = 7degrees freedom);
- for Total variation n – 1 (9 – 1 = 8 degrees freedom).

Sum Square (SS) is the sum of squares of deviationsModified Sum (MS) represents the amended dispersion.
F, Fisfer global significance of regression test.
Significance F represents the risk level..
Coefficients represent the estimated values of coefficients a and b.
Lower 95%, Upper 95%, and Lower 99%, Upper 99% represent the lower and upper limit of the confidence interval for the given parameter with a probability of 95%, and 99%.

3.1. Testing the validity of the model

In order to test the validity of the proposed model we establish the following hypotheses:
H_0: the model is not valid (null hypothesis)
H_1: the model is valid (alternative hypothesis)
Comparing $F_{calculated} = 35,75$ with $F_{\alpha;\, k;\, n-k-1} = F_{0.1;\, 1;\, 7} = 12,25$, we obtain $F_{calculated} > F_{0.1;\, 1;\, 7}$. As pvalue (Significance F) < α (0,00055 < 0,1) results that hypothesis H_0 is rejected and hypothesis H_1 is accepted, so the model is valid.

3.2. Testing the intensity of the link between the two variables.

The correlation coefficientr = 0,91447 → 1, so we can say that there is a direct and powerful connection between the two variables. We test the significance of the correlation coefficient for the general collectivity and we establish the following hypotheses:
H'_0: the correlation coefficient is not statistically significant (null hypothesis)
H'_1: the correlation coefficient is statistically significant (alternative hypothesis)
As we can see in the data analyzed in Table No. 2., we have $t_{calculat} = 5,979$, and according to the distribution Student $t_{\alpha;\, n-2} = t_{0,1;\, 7} = 3,499$
So we have $t_{calculated} > t_{0.1;\, 7}$, results that hypothesis H_0 is rejected and hypothesis H_1 is accepted, so the correlation coefficient is statistically significant.
The correlation report isR = 0,91447, we have
R = r, so we can say that there is a linear connection between the two variables.
We test the significance of the correlation report and we establish the following hypotheses:
H''_0: the correlation coefficient is not statistically significant (null hypothesis)
H''_1: the correlation coefficient is statistically significant (alternative hypothesis)

From the data presented in Table No. 2.we can see that $F_{calculated} = 35,75$. According to function F table we have $F_{0.1;\, 1;\, 7} = 12,25$. So we have $F_{calculated} > F_{0.1;\, 1;\, 7}$, results that hypothesis H_0 is rejected and hypothesis H_1 is accepted, so the correlation report is statistically significant.
By using the coefficient of determination of the quality of the adjustment R square (R^2) we measure the intensity of the link between variables. Because R^2 = 0,8363 (Table No. 2.), results that the intensity of the connection is strong.So we can say that 83,63%of the turnover is explained by the variation in exports.
Predicted turnover representsthe value of Y forecasted for the given observation. It is obtained by replacing the X values of the observation in equation Y = 706,52 + 1,257X. Because the sum of adjusted values of Y is equal with the sum of the empirical values of Y, results that the regression equation is correct (Anghelache et al., 2013).
Residuals represent the value of the prediction error; for each observation it is calculated as the difference between the observed value and predicted value. Suma Residuals equals 0. (Table No. 3.)

4. Conclusions

In the research of the dependence between the turnover and exports in footwear industry, the pairs of points on the graphic (Figure No. 2.) follow the trajectory of a straight line, so the analysis of the reserched phenomenon was possible,with the help of the simple linear regression model.
The final regression model which reflects the correlation between turnover and exports in footwear industry, it is presented as it follows:
The turnover = 706,52 + 1,257*Exports
The linear regression function shows that for an increase of exports by one unit it will obtain a turnover increase of 1,257 monetary units.Because the free term value is fairly high (706,52), we can say that the factors that haven't been taken into consideration when building the econometric model, have an influence on turnover; the positive value of the free term indicates that these factors have a positive effect on turnover of footwear industry.
The fact that there isn't any correlation between the independent variable X and residuals can be observed by the shape of the cloud of points (Figure No. 3.), so we can say that the model is well chosen.

5. Acknowledgements

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6. References

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Appendix A

Table No. 1.
The evolution of turnover and direct exports,
in footwear industry, between 2004-2012 (millions lei)

Year	Turnover	Exports
2004	2.561	1.748
2005	2.549	1.635
2006	2.931	1.812
2007	3.067	1.680
2008	3.059	1.594
2009	2.910	1.766
2010	3.330	2.138
2011	3.975	2.551
2012	3.953	2.557

Source: Self processing after*Anuarul Statistic al României* (https://statistici.insse.ro/, 2014)

Table No. 2.
Estimation of the regression model in Excel

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0,914470207							
R Square	0,836255759							
Adjusted R Square	0,812863724							
Standard Error	226,1818609							
Observations	9							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	1	1828886,153	1828886,153	35,74959	0,000553695			
Residual	7	358107,6394	51158,23419					
Total	8	2186993,792						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 99,0%*	*Upper 99,0%*
Intercept	706,520614	415,2856698	1,70128821	0,13268	-275,4739523	1688,51518	-746,7646513	2159,805879
Exporturi	1,256997003	0,210231931	5,979096503	0,000554	0,759877481	1,754116526	0,521293872	1,992700135

Source: Procesing of the data taken from the website https://statistici.insse.ro/, 2014, procesing made bymeans of the software package Data Analysis from Excel

Table No. 3.
Forecast turnover of footwear industry and
deviations from the real development, during 2004-2012

RESIDUAL OUTPUT		
Observation	*Predicted Turnover*	*Residuals*
1	2904,081158	-343,5360829
2	2761,524001	-212,5745855
3	2984,751238	-53,74391239
4	2818,612758	248,4498912
5	2710,606086	348,059065
6	2926,119352	-15,88355828
7	3394,341991	-63,98164912
8	3913,378177	61,63383902
9	3921,206386	31,57699298

Source: Procesing of the software package Data Analysis from Excel

Appendix B

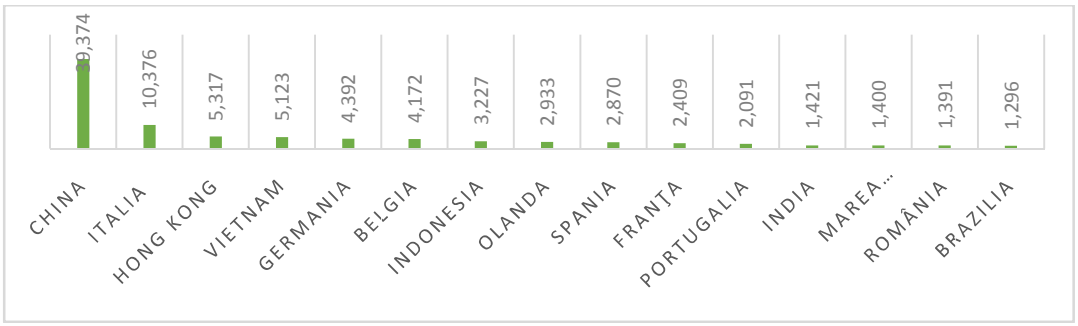

Figure No. 1. Distribution of the countriesexporting footwear in the world(millions dollars)

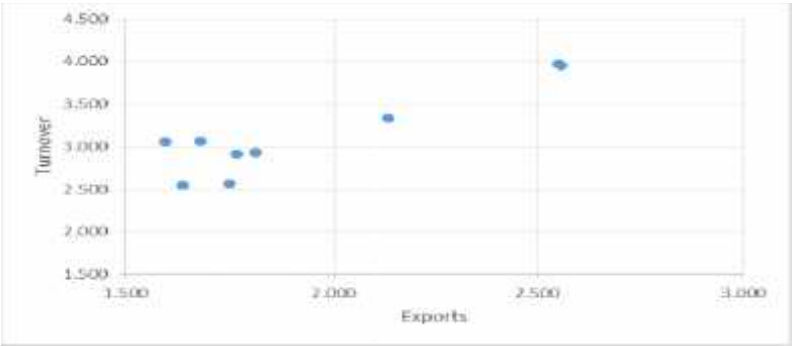

Figure No. 2. The evolution of turnover depending on exports variation, in footwear industry, during 2004-2012

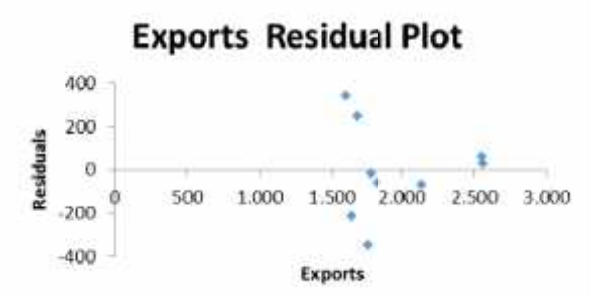

Figure No. 3. Diagram:independent variable versus residuals