EVOLUTION OF THE ROMANIAN LABOUR MARKET - ANALYSIS AND FORECAST OF STATISTICAL INDICATORS FROM 2005 TO 2019

E. GRĂJDIERU (COMAN) [1]   I.M. CIONGRADI[2]

Abstract: *The purpose of this paper is to forecast the number of job vacancies on the Romanian labour market using an econometric model. In order to achieve this purpose, the researchers analysed eight statistical indicators using the multiple regression. The conclusions point out that only four of independent variables have a significant influence on the number of vacancies and only these were used for forecasting. Research results show that in 2019 there will be a significant increase in the number of vacancies. This is largely due to the drop in the number of the usual resident population.*

Key words: *labour shortages, job vacancies, econometric model, forecasting*

1. Introduction

After the 1989 revolution the Romanian labour market underwent considerable changes. Because of the closure of many factories and state-owned enterprises the unemployment rate rose sharply. If in 1991 the unemployment rate was only 3%, in 1992 it almost tripled, reaching 8.2%, and in 1999 a maximum rate of 11.8% was recorded (Tempo, 2018). In 2003 the situation began to improve, and since 2005 the phenomenon of labour shortage has emerged (Cindrea, 2007, p.25). Labour shortages occur when demand for a certain category of specialists exceeds the supply of qualified workers that are looking for a job in a particular field (Visco, 2001, p.4). This phenomenon is largely caused by the fact that the number of active enterprises has doubled from 2005 to 2016 (Tempo, 2018), as well as negative natural growth and population migration.

The phenomenon of labour shortages is reflected in the number of vacancies, which depends largely on the economic activity of enterprises, but also on certain demographic and labour market indicators. The purpose of this paper is to establish the validity of the regression model to use it to forecast the average number of job vacancies.

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[1] *Transilvania* University of Braşov, ecaterina.grajdieru@unitbv.ro
[2] *Transilvania* University of Braşov, ioana.ciongradi@unitbv.ro

2. Methodology

To achieve the purpose of this paper, statistical indicators of the Romanian labour market and demographic indicators was analysed using Microsoft Office Excel. Using multiple regression, the following parameters of the econometric model were analysed: the number of vacancies, the number of economically active population, the employment rate, the unemployment rate, the number of usually resident population, the natural increase, the number of emigrants and the net average monthly wage.

Information on the statistical indicators used in this paper was obtained from the online database of the National Institute of Statistics (Tempo). The analysis was conducted for the period 2005 to 2017, this being the period when the workforce shortage appeared, and businesses have started to encounter difficulties in occupying vacancies.

Based on the multiple regression analysis, the parameters of the econometric model were estimated, the correlations between the variables were analysed, the significance of the explanatory variables was tested and the validity of the multiple regression model has been established. This information was used for forecasts for the years 2018-2019.

3. Econometric Modelling of Romanian Labour Market

The econometric modelling considered eight variables. The data used for multiple regression are presented in *Table 1*.

Data used for construction the multiple regression								Table 1
Year	No. of vacancies	Economically active population (thousands)	Employ-ment rate (%)	Unemploy-ment rate (%)	No. of ussually resident population	Natural increase (persons)	No. of emigrants	Net average monthly wage (lei)
2005	73380	8913.4	60.6	5.9	21382354	-41081	10938	746
2006	80557	8929.8	51.8	5.2	21257016	-38611	14197	866
2007	95972	9093.7	52.8	4	21130503	-37237	8830	1042
2008	92222	9150.4	53.5	4.4	20635460	-31302	8739	1309
2009	38625	9120.1	53.7	7.8	20440290	-34825	10211	1361
2010	24239	8998.3	52.1	7	20294683	-47524	7906	1391
2011	26057	8826.5	59.3	5.2	20199059	-55197	18307	1444
2012	24825	9063.4	60.2	5.4	20095996	-54435	18001	1507
2013	30643	9042.9	60.1	5.7	20020074	-35534	19056	1579
2014	38523	8910	61	5.4	19953089	-53103	11251	1697
2015	49952	8776.8	61.4	5	19875542	-56791	15235	1859
2016	59753	8735.8	61.6	4.8	19760585	-54316	22807	2046
2017	60000	9120	63.9	4	19644350	-69192	23156	2338

Source: *TEMPO online database, available at http://statistici.insse.ro/shop*

The econometric modelling considered the number of job vacancies (Y_t) as interesting variable and the following variables were considered as factors of influence: number of economically active population (X_1), employment rate (%) (X_2), unemployment rate (%)(X_3), number of usually resident population (X_4), natural increase (X_5), number of emigrants (X_6) and net average monthly wage (lei) (X_7).

In the first phase, the linear regression model was constructed, which included the dependent variable and seven independent variables. Thus, the model obtained was the following:

$$Y_t = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6 + a_7X_7 + \varepsilon, \text{ where:}$$

$a_0, a_1, a_2, a_3, a_4, a_5, a_6, a_7$ - model parameters;
ε = specification error.

The information was analysed using the Data Analysis tool from Microsoft Office Excel and the results obtained are shown in *Table 2*.

The regression table of the model with seven explanatory variables   Table 2

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99046
R Square	0.98101
Adjusted R Square	0.95442
Standard Error	5486.29
Observations	13

ANOVA

	df	SS	MS	F	Significance F
Regression	7	7773556303	1.1E+09	36.8947	0.00052199
Residual	5	150496825	3E+07		
Total	12	7924053128			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1636642	262368.682	-6.23795	0.00155	-2311082.1	-962202	-2311082	-962202
X Variable 1	-24.9207	13.4638927	-1.85093	0.1234	-59.53078	9.6893	-59.5308	9.6893
X Variable 2	143.625	620.769107	0.23137	0.8262	-1452.1125	1739.36	-1452.11	1739.36
X Variable 3	-9660.44	1927.097	-5.01295	0.00406	-14614.201	-4706.68	-14614.2	-4706.68
X Variable 4	0.09126	0.01070319	8.52678	0.00037	0.06375032	0.11878	0.06375	0.11878
X Variable 5	1.03249	0.24622357	4.19329	0.00854	0.39954996	1.66543	0.39955	1.66543
X Variable 6	-0.99779	0.48359247	-2.06329	0.09404	-2.2409035	0.24532	-2.2409	0.24532
X Variable 7	109.763	14.9327982	7.35049	0.00073	71.3774063	148.149	71.37741	148.149

The determination coefficient of this model is 0.98, which demonstrates that the linear model explains about 98% of the variance of the number of vacancies depending on the 7 variables considered. The multiple correlation coefficient of 0.99 shows that there is a very strong correlation between the eight variables.

The theoretical value of Student ratio is 2.57, with a significance level of 95% and 5 degrees of freedom. By comparing Student ratio for each regression coefficient with Student theoretical value, we see that unemployment rate, the number of usually resident population, the natural increase and the net average monthly wage significantly influence the variance of the number of vacancies. On the other hand, the number of the economically active population, the employment rate and the number of emigrants (variables X_1, X_2 and X_6) does not contribute to explaining the variance of the number of vacancies (Y).

Although the model seems to be well chosen, because the determination coefficient is very good and the Fisher Test shows that it is a significant global regression, the variables X_1, X_2 and X_6 are not significant and will be removed from the model. The P-value of these three variables is higher than 0.05 which indicates they are insignificant.

After removing from the regression model the variables that do not significantly influence the variance of the number of vacancies, the following results were obtained:

The regression table of the model with four explanatory variables   Table 3

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.97725
R Square	0.95502
Adjusted R Square	0.93253
Standard Error	6674.93
Observations	13

ANOVA

	df	SS	MS	F	Significance F
Regression	4	7567615600	1.9E+09	42.4625	1.9733E-05
Residual	8	356437527	4.5E+07		
Total	12	7924053128			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1809330	288423.659	-6.27317	0.00024	-2474436.1	-1144224	-2474436	-1144224
X Variable 1	-8923.23	2264.02116	-3.94132	0.00429	-14144.074	-3702.39	-14144.1	-3702.39
X Variable 2	0.0888	0.01262757	7.0321	0.00011	0.05967904	0.11792	0.059679	0.11792
X Variable 3	0.94944	0.25655181	3.70077	0.00604	0.35782849	1.54105	0.357828	1.54105
X Variable 4	99.729	17.3523194	5.7473	0.00043	59.7145178	139.744	59.71452	139.744

The model is validated by the determination coefficient, the value of which is 0.95. Thus, this model explains in proportion of about 95% the variance of the number of

vacancies. The Fisher test shows that it is a significant global regression. The calculated *F** value corresponds to a significance threshold of 0.002%, being much lower than 5%, as shown by *Significance F* in Table 3. It can be seen in the previous regression that the significance threshold of *F** is higher (0.05%) than in this regression, therefore the second regression has a higher significance and the model is better constructed.

4. Forecasting Statistical Indicators of Romanian Labour Market for 2018 and 2019

Considering the second econometric model, it is sufficient to forecast the dependent variable and the most significant independent variables that influence evolution of job vacancies. In order to determine the type of correlation between the dependent variable and the four independent variables that have an important significance on the evolution of the number of vacancies, the Pearson correlation coefficient was calculated.

The highest correlation coefficient is between the dependent variable and the number of usually resident population, whose value is -0.765 and indicates strong indirect correlation. For this indicator the Pearson correlation coefficient was calculated just for the period 2009-2017, because in the years 2007-2008 there were a record number of vacancies and they distort the analysis. Another reverse correlation of a medium intensity with a value of -0.564 is between number of vacancies and unemployment rate. Natural increase is in direct connection whit the number of vacancies, having a correlation coefficient of 0.377. There is also an weak connection (-0.358) between the dependent variable and the net average monthly wage, but this is a reverse one.

Fig.1 shows that the number of usually resident population in Romania will continue to decrease in 2019, with a decline of 0.03% compared to 2017. It will seriously affect the labour market, and the number of vacancies will increase as a result of the difficulty of occupation.
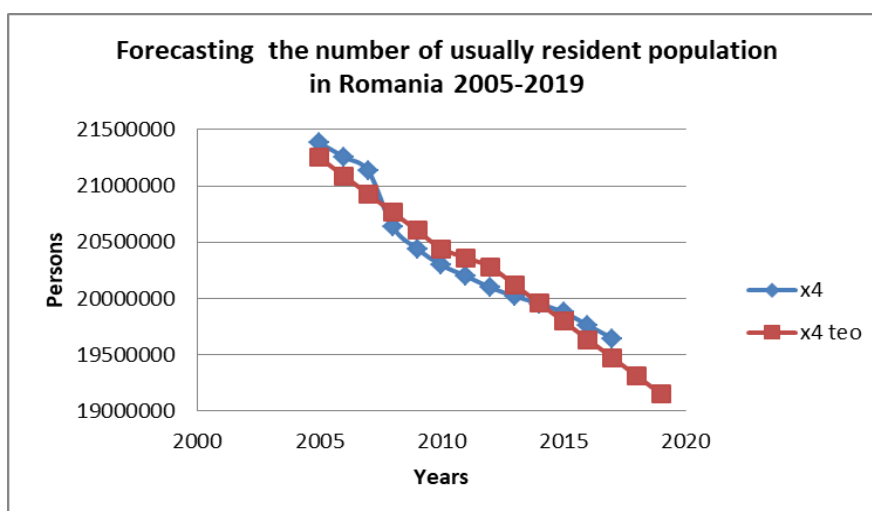

Fig.1. *Forecasting the number of usually resident population in Romania (2005-2019)*

For the analysis and forecast of the unemployment rate a dummy variable was included for considering the years 2007, 2008 and 2017, when the unemployment rate was very low and another one for the years 2009 and 2010 when the recorded unemployment rate was very high. As can be seen in Fig. 2, the unemployment rate is expected to grow slightly, which will influence the increasing number of job vacancies.
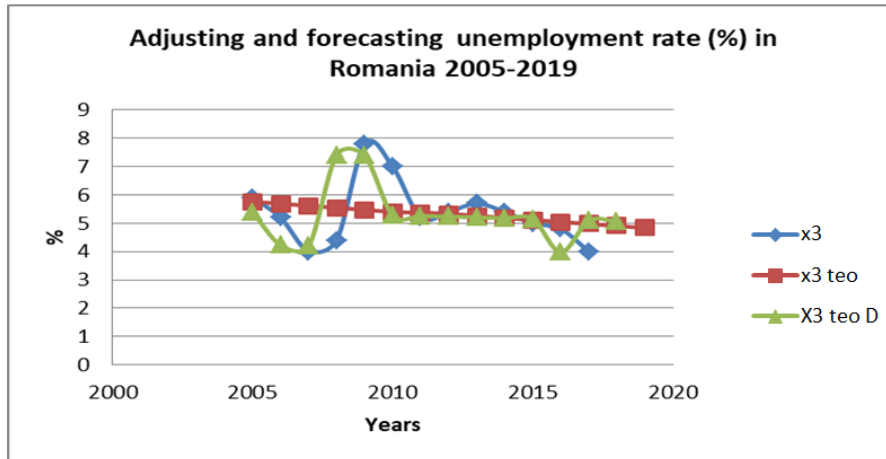

Fig.2. *Adjusting and forecasting unemployment rate in Romania between 2005-2019*

For the analysis and forecast of the natural increase a dummy variable was included for considering these years 2006, 2007, 2008, 2009 and 2013, when the value of natural increase was closer to 0. Fig.3 shows that the natural increase will be better in 2019, which could have little effect on reducing the number of vacancies by occupying them.
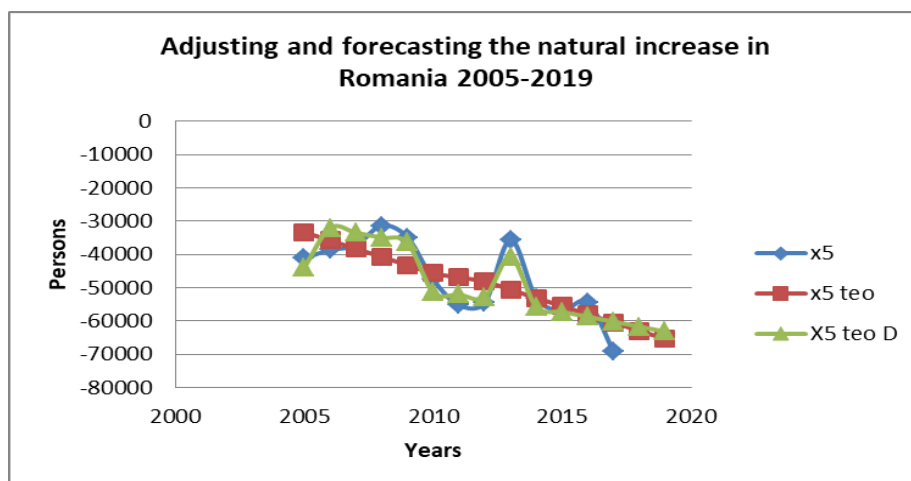

Fig.3. *Adjusting and forecasting the natural increase in Romania between 2005-2019*

The increase of the average monthly net wage forecast for the year 2019 (Fig. 4) could have the effect of reducing the number of job vacancies in two ways: on the one hand by the fact that employers will offer higher salaries, which could motivate people not to

go abroad, and on the other hand, by closure of many companies that can not afford higher wages or by relocating to other countries with lower wages.
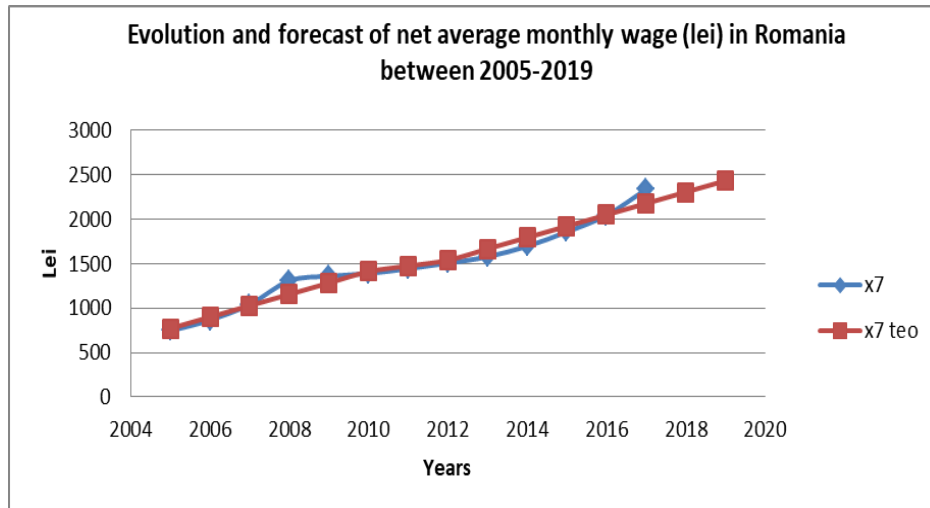

Fig.4. *Evolution and forecasting of net average monthly wage in Romania (2005-2019)*

Using the analysis and forecasts for the significant indicators influencing the number of the vacancies, it was possible to adjust and forecast the number of job vacancies for the years 2018 and 2019, as can be seen below:
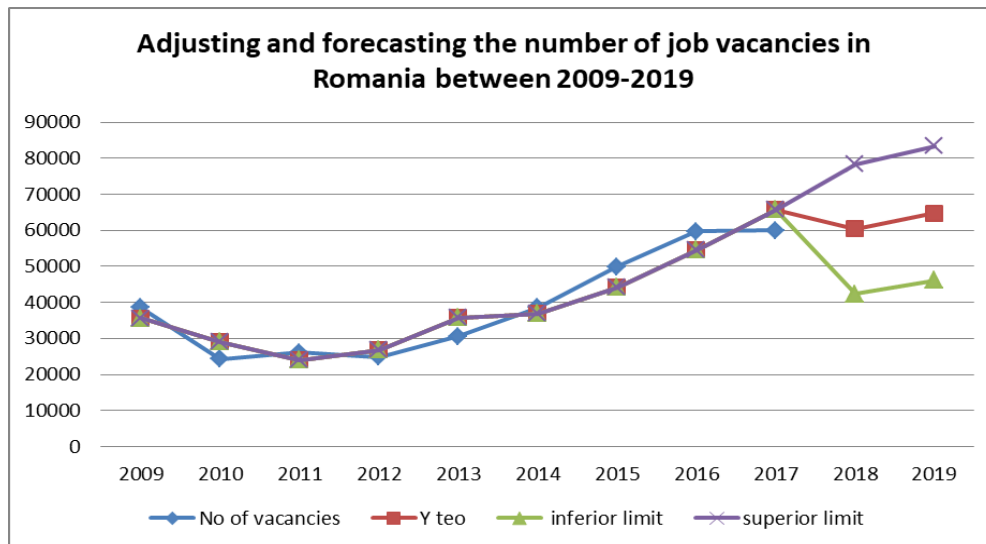

Fig.5 *Adjusting and forecasting the number of job vacancies in Romania between 2005-2019*

The number of vacancies decreased considerably in 2009 as a result of the economic crisis from 2008, therefore, in order to make a viable forecast, only data from 2009-2019

were used. Thus, it can be seen from Fig. 5 that the number of vacancies will increase and, because of the forecast error, the variable may oscillate between the inferior limit, which implies a decrease in the number of jobs vacancies, and the superior limit, which implies a steady increase up to the value of 83318.

5. Conclusions and Discussions

The econometric model that has been developed and validated in this paper includes only the indicators that have a significant influence on the number of vacancies on the Romanian labour market, these being the following: unemployment rate (%), number of usually resident population, natural increase, and net average monthly wage (lei). The most intense correlation is between the number of usually resident population and the dependent variable, the Pearson correlation coefficient being -0.765 and indicates a strong reverse correlation.

Using the analysis and forecasts for the significant indicators influencing the number of the vacancies, the forecast was made for the number of job vacancies for the years 2018 and 2019. Because of the economic crisis from 2008, the number of vacancies decreased considerably in 2009. Therefore, in order to make a viable forecast for the number of vacancies, only data from 2009-2019 were used.

Research results show that in 2019 there will be a significant increase in the number of vacancies. This is largely due to the drop in the number of the usual resident population. Thus, the number of vacancies could exceed the value from 2006. However, a high job offer makes candidates more and more selective, and organizations face more difficulties in attracting and retaining valuable people.

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