

A STATISTICAL ANALYSIS OF DISTRIBUTION OF UNEMPLOYMENT IN ROMANIA, BETWEEN 1991-2010

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Abstract

The unemployment represents a big problem at local and national level for every country. The most of the society problems are determined by this and also the criminality rate is proportional with the unemployment rate. If before the 1989 Romanian Revolution the rate of the unemployment was relatively low, in the last 20 years this rate experienced high and uncontrolled increases because the instability of national economy. Obviously one of the main reason was the disappearance of many combined and manufacturers or the privatization of these. Another cause was the fact that most of the Romanian people, especially younger between 18 and 40 years of age and especially in the 2000's has gone for working abroad. For this reason the national economy has declined dramatically and in the beginning of the new millennium, more exactly the first 4-5 years, the unemployment rate was one of the highest from entire Europe and the highest from the Central and Southern Europe. Fortunately, in the last 5-6 years the national Romanian economy has known a relatively increase because of the foreign investors that either took some of the manufacturers that were in decay either built new ones and therefore hire the workforce from the country. Also, another important thing is represented by the investments in the tourism, an area that represented a national force in the 70's and 80's. In this paper, based on the data collected from the National Institute of Statistics we want to do an analysis of the unemployment for the period of the last 2 decades, with a step of approximately 10 years, in order to observe some differences between the number of unemployed people from three different periods: 90's, 00's and 10's.

Key words: national economy, unemployment rate, forest, statistical analysis, unemployment maps

In this paper we want to make a complete statistical analysis of the unemployment from our country. For a better view of this problem we take into account also Bucharest and Ilfov.

In the first part of the paper, we determined the basic statistical indicators. Then, in the second part of the paper, we concentrated on the correlation establishment between the unemployment on three different years, at a statistically significant distance, approximately a decade (1991, 2001 and 2010). For a better view of statistical distributions we chose the graphical representation, using histograms and maps. We first analyzed the comparison between unemployment by counties, for the years 1991 and 2010. We find that, during this 20 years period, there are significant changes on unemployment distribution in Romania. It also noted that the counties with highest unemployment in 1991 are not so different from counties with highest unemployment from 2001, respectively 2010: Iasi, Neamt and Dolj for the year 1991, Hunedoara, Neamt and Dolj for the year 2001 and Iasi, Prahova and Dolj for the year 2010.

MATERIAL AND METHOD

Based on the data of unemployment distributed by counties, we initially set the number of classes, but also relative and cumulative frequencies for each of these years, 1991, 2001 and 2010. Table 1 presents the frequency classes with their relative frequencies. It is important to notice that the classes for the years taken into account were not the same, because we have a different rate of unemployment for every of the years 1991, 2001 and 2010. If in the year 1991 the unemployment rate was relatively low, this has increased alarmingly in the year 2001. In the last years the number of unemployed people has decreased because many people left for the abroad and also they are an increase of national economy, because an important part of the money obtained there was invested in our country and therefore has generated new jobs.

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Table 1 The classes for the years 1990, 2000 and 2010

Year 1991		Year 2001		Year 2010	
Class	The effective of the class	Class	The effective of the class	Class	The effective of the class
0-3000	3	0-5000	0	0-5000	0
3001-6000	10	5001-10000	4	5001-10000	7
6001-9000	13	10001-15000	6	10001-15000	13
9001-12000	9	15001-20000	12	15001-20000	15
12001-1500	2	20001-25000	4	20001-25000	2
15000-∞	4	25001-30000	7	25001-∞	3
		30001-35000	4		
		35001-∞	3		

As it can be seen from the table, the number of classes is not the same for the years taken into account. For the year 1991 we have 6 classes with a step of 3000 and for the years 2001 and 2010 we have 8, respectively 6 classes, both with a step of 5000. The next step was the computing and graphical representation of relative and cumulative frequencies for each of the three years, in order to develop the histograms that give the relative frequency curves. These allow us to locate the concentration and dispersion area of distribution and also their discontinuities. We worked with three sets of data, corresponding for the years 1991, 2001 and 2010, so the representation of three different graphs was necessary, as it shown below (fig. 1 a, b, c).

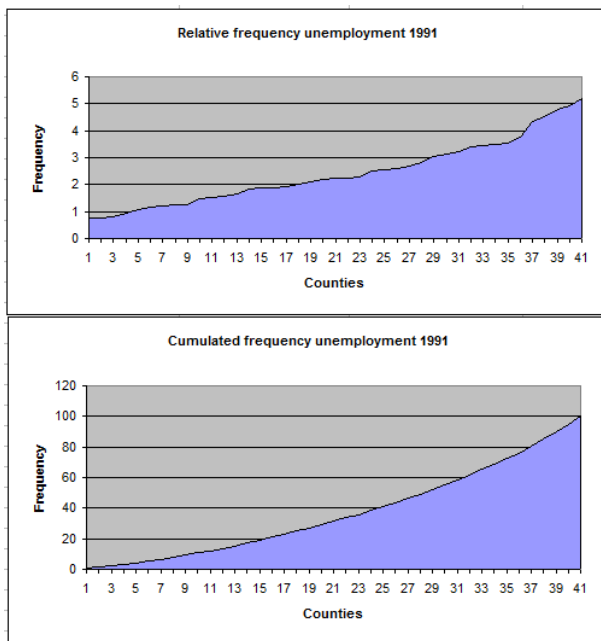


Figure 1.a Relative frequency and cumulative frequency - 1991

The cities with the lowest percentage of unemployment for the year 1991 were Covasna, Gorj, Alba, Arad, Calarasi, Harghita, Sibiu, Brasov, Timis and Giurgiu with the relative frequencies of 0.75, 0.75, 0.80, 0.96, 1.05, 1.18, 1.18, 1.25, 1.26 and 1.46, all data in percentage. The cities with the highest percentage of unemployment were Hunedoara, Suceava, Iasi, Neamt and Dolj with 3.74, 4.36, 4.53, 4.80 and 4.95, also all in percentage. Bucharest and Ilfov has, in all analysis

the highest unemployment rate, but this thing is because the highest number of inhabitants.

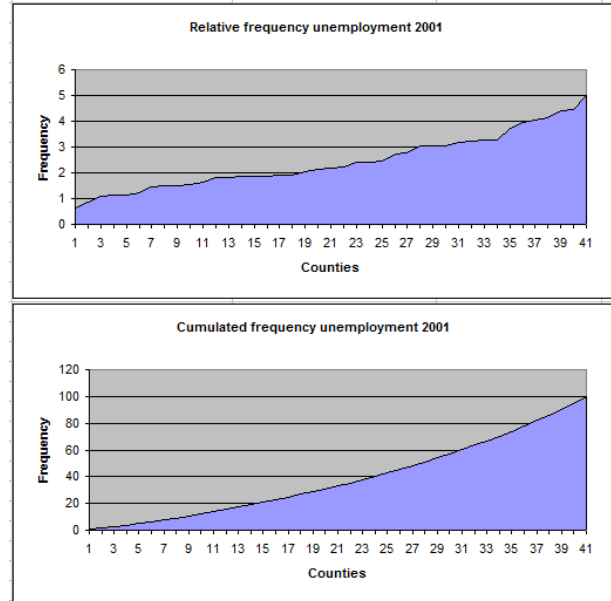


Figure 1.b Relative frequency and cumulative frequency – 2001

The first 10 cities with the lowest percentage of unemployment for the year 2001 were Satu-Mare, Giurgiu, Vrancea, Covasna, Tulcea, Salaj, Calarasi, Arad, Mehedinti and Harghita with the percentage of relative frequencies of 0.61, 0.86, 1.10, 1.13, 1.13, 1.24, 1.47, 1.49, 1.49 and 1.56. The cities with the highest percentage of unemployment were Iasi, Prahova, Hunedoara, Neamt and Dolj with the percentage of relative frequencies of 3.96, 4.02, 4.15, 4.42 and 4.43. It is easy to notice that the cities with the highest unemployment percentage are almost the same for the years 1991 and 2001.

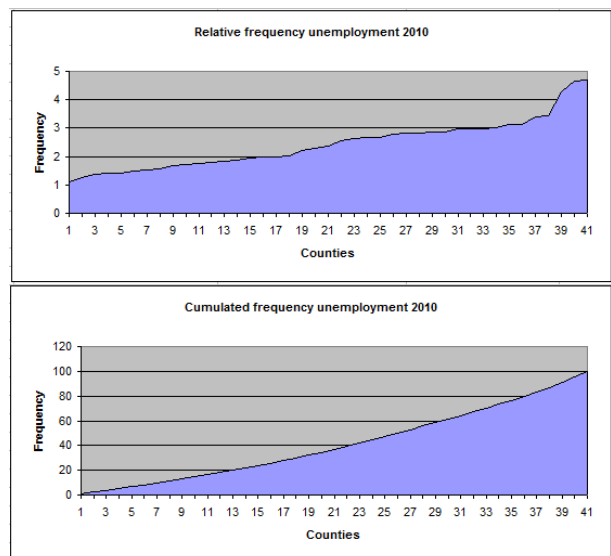


Figure 1.c Relative frequency and cumulative frequency - 2010

The first 10 cities with the lowest percentage of unemployment for the year 2010 were Tulcea, Giurgiu, Bistrita-Nasaud, Salaj, Covasna, Satu-

Mare, Calarasi, Botosani, Ialomita and Sibiu with the percentage of relative frequencies of 1.12, 1.25, 1.37, 1.42, 1.42, 1.49, 1.53, 1.56, 1.67 and 1.71. The cities with the highest percentage of unemployment were Mures, Galati, Iasi, Prahova and Dolj with the percentage of relative frequencies of 3.14, 3.39, 3.42, 4.28 and 4.65.

In the next stage we calculated the central values and the dispersion parameters for the three considered years, for all counties. The computing of the mean values was required to determine the central tendency in the evolution of the unemployment and also to determine deviations from the mean. The tables below show the basic statistical indicators for these three years which were taken into account:

Table 2: Central values for the three years considered

Central measure	Year 1991	Year 2001	Year 2010
Mean	8230.243902	20282.56098	15291.70732
Median	7524	17967	14821
Mode	-	-	-

Table 3: Dispersion parameters for the three years considered

Dispersion parameters	Year 1991	Year 2001	Year 2010
Minimum value	2546	5151	7038
Maximum value	17582	41464	29331
Amplitude	15036	36313	22293
Variance	16728460.69	81179410.45	30115131.21
Standard deviation	4090.044094	9009.961734	5487.725504
Quartile 1	5102	13583	11068
Quartile 2	7524	17967	14821
Quartile 3	10916	26464	18563
Interquartile distance	5814	12881	7495

RESULTS AND DISCUSSIONS

The determination of the central values and variance parameters was done after we put the data in ascending order. We noticed that counties like Covasna, Tulcea, Sibiu or Giurgiu has a small rate of unemployment, a trend maintained throughout the entire period take into account. A very simple explanation is that these counties are relatively small, but this is not a general explanation and should not be generalized.

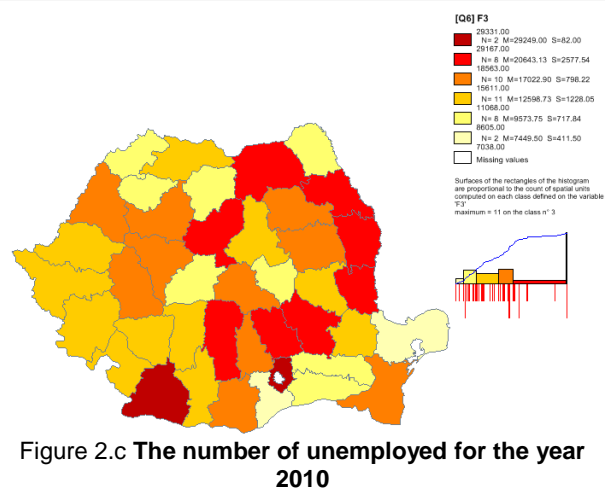
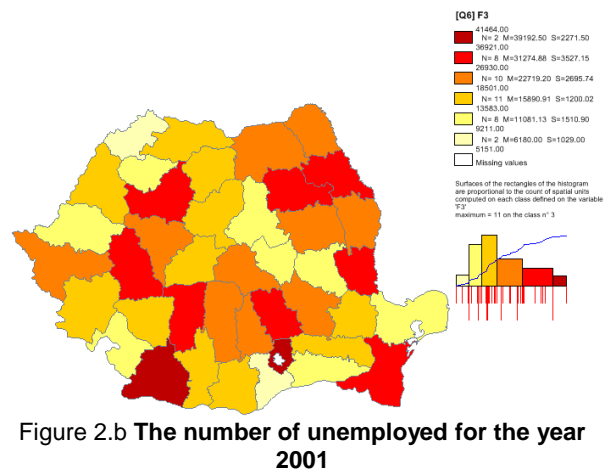
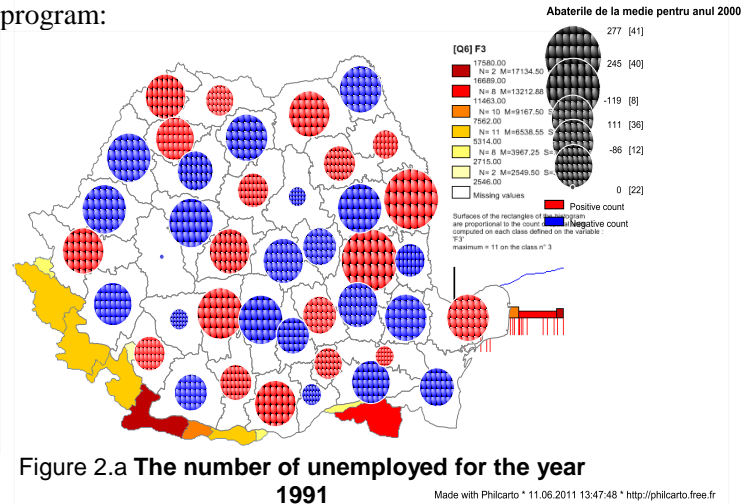
Regarding the mean of the entire area for these three years, there is an increase trend for the year 2001. The median is very close to the mean value, for the years 1991 and 2010 and quite far for the year 2001, so we can say that the data are normally distributed, i.e. their distribution is Gaussian (most values are very close to the mean value).

The standard deviation is relatively high for each of these three years which is normal considering the fact that the observed values for each of the 41 counties are not closed to each other: e.g. there are counties when the number of unemployed are under 3000 (Covasna, Gorj or Alba) and in the other counties the number of unemployed is over 15000 (Iasi, Dolj, Neamt or Bucharest + Ilfov) for

the year 1991 and so on. Thus, for these counties that have large deviations from the mean, the z score is also high. So:

- for Covasna: -1.389775702;
- for Gorj: -1.388064229;
- for Dolj: 2.068133229;
- for Bucharest + Ilfov: 2.286468283.

Figure 2 (a and b) represent the maps for unemployment for all the three years taken into account. These maps were realized in PhilCarto program:



The light colours are for the counties with a low level of unemployment and the dark colours are for

these with a high level. In the year 1991 the counties from Moldavia and Dobrogea and South-East area were affected by a high level of unemployment, while the counties from Central-West area of the country had a low level. In the Figure 2.b we notice a spread dispersion of the counties, but it can notice that also Moldavia remains a disadvantaged area from this point of view. Finally, in the Figure 2.c we note a strong development of Dobrogea area and partially Transylvania, Banat and Muntenia.

To see the interdependence between the values of these three distributions of data, we made three correlations: between total number of unemployed 1991 and 2001, 2001 and 2010, 1991 and 2010.

Referring to the standard deviation, the Figure 3 presents the standard deviations for the year 1991:

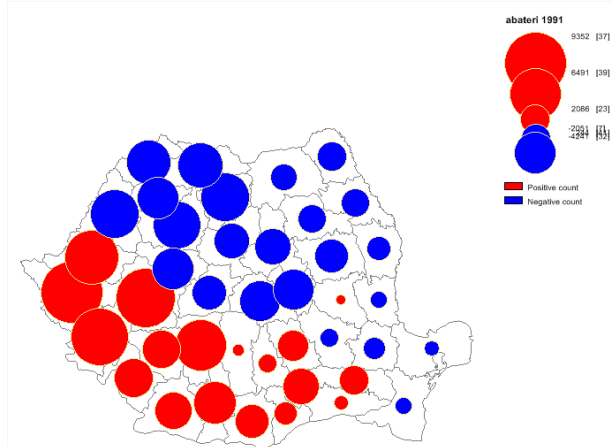


Figure 3 Standard deviations for the year 1991

As we expected, the random variables, two by two, represented by these three years take into account, are not perfectly positively correlated, i.e. the correlation result, r , is quite far to 1 in all of these three cases, especially in the last one. The Figures 4 (a and b) demonstrates this:



Figure 4.a The regression line for correlation between the years 1991 and 2001

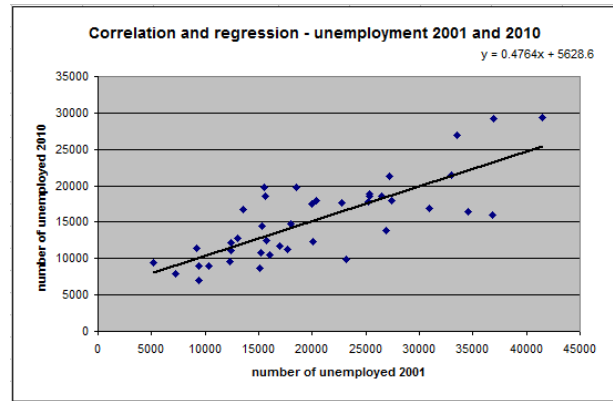


Figure 4.b The regression line for correlation between the years 2001 and 2010

In the table below we presented the values of r coefficients (the empirical correlation coefficient) and r^2 (the determination coefficient) as well as the slope and the intercept of regression line. These four values are the most important correlation and regression factors:

Table 4 The values of regression coefficients

Years/Values	r coefficient	r^2 coefficient	slope	intercept
1991-2001	0.749067578	0.561102237	1.650121628	6701.657509
2001-2010	0.782208429	0.611850026	0.476422128	5628.646452
1991-2010	0.585785655	0.343144834	0.785964847	8823.024926

So, for these three cases we got the following results:

- 56.11% of unemployment values for the year 2001 are influenced by unemployment values for the year 1991;
- 61.18% of unemployment values for the year 2010 are influenced by unemployment values for the year 2001;
- 34.31% of unemployment values for the year 2010 are influenced by unemployment values for the year 1991.

From the Figure 5 we can see that the points are far to the regression line, proving the correlation weakness. The relationships for regression lines are as they follow:

- for the years 1991 and 2001: $y = 1.6501x + 6701.7$;
- for the years 2001 and 2010: $y = 0.4764x + 5628.6$;

The residuals map for the years 2001 and 2010 is presented below:

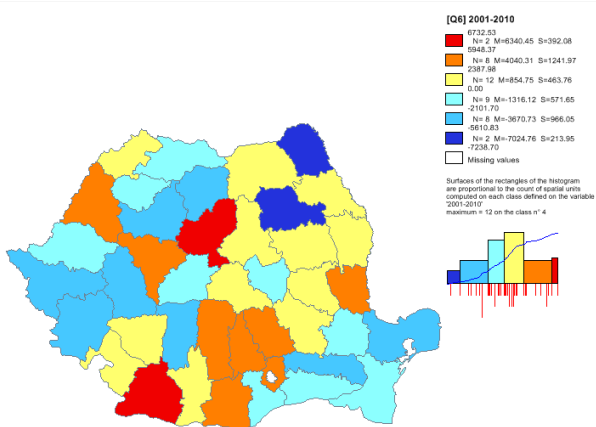


Figure 5.a The residuals map for the years 1990 and 2010

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As a future direction we want to make an analysis of these values based on the number of inhabitants of these counties. It is not a rule that the number of inhabitants of a county or an area is proportionally to the number of unemployed, but is an important index that would be taken into account.

CONCLUSIONS

In this paper we've made a complete statistical analysis, for three representative years, 1991, 2001 and 2010, of one of main problem for our country, the unemployment. As we can say in the beginning, this problem is very serious for each country, because a high unemployment rate leads to a high crime level. This was the main reason for choosing these data, and following the analysis it can be drawn some conclusions:

- they are an alarmingly increase of unemployment for the year 2001 compared to the year 1991, but a low decrease for the year 2010 compared to the 2001;
- the correlation between the values of unemployment for the years 1991 and 2001 is relatively low, between the years 2001 and 2010 is quite higher over, but very low between the years 1991 and 2010;

The use of statistics for geographical and geopolitical problems is very important in order to track and visualize numerous factors that underlie a natural balance. The main goal of using these correlations is to highlight some links or differences between various parameters or to show how much a geographical factor is influenced by others factors.

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