Gross Domestic Product/inhabitant and Occupation of the Labor Force

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Abstract
The author analyzes the correlation between two important macroeconomic indicators, the GDP/inhabitant and the degree of occupation of the labor force. This correlation reveals the importance of the second indicator for the evolution of the GDP. The results, achieved by using Eviews 5.1, are presented in both descriptive and graphical manner.

Key words: labor force, correlation, hypothesis, model, estimation

JEL Classification: E01

Regression and correlation method indicates how the characteristic result of „Y” changes in conditions where the characteristics of values „X” changes. The goal of regression is to identify the mathematical relationship that exist between two variables.

To assess the intensity of the relationship between two variables, the level of correlation between them is determined, which indicates the intensity of the connection between variables by measuring the scattering degree of recorded data around the regression line.

Employment rate of the population
General employment rate calculated as a ratio between population and total population was 43.05%, by using the relationship:

\[ RO_g = \frac{PO}{PT} \times 100 \]

where: RO = employment rate
PT = total population
PO = employment population.

The employment rate of working age population (15- 64 years) is calculated by gender and by area.

From the calculations made, it results that the employment rate of working age population (15- 64 years) registered in 2011 levels of 58.5%, with higher values for the employed male 65% compared to 52% for the females and those in rural areas 58.8% to 58.2% for those in urban areas.

The analysis considered data sets and the estimation the parameters of regression model was performed using specialized software package Eviews 5.1.
Thus, in a first stage of analysis peculiarities of the two data sets previously considered were studied.

As can be seen from the above table, the evolution of the two macroeconomic indicators is very similar, with sharp increases for the period 1990 - 2008 and a decrease of approximately 4 to 5% in 2009.

To confirm the above hypothesis, we performed the graphical representation of data series (using at this specific commands implemented within the software package Eviews 5.1), this tool is particularly useful for identifying a typology that defines the correlation function of the two indicators analyzed:
As you can see, the graphic above evidences a direct linear connection between the two indicators, which allows us to affirm that it is possible to use simple linear regression model to study the dependence between the GDP per inhabitant and the employment rate of the population.

Estimating the parameters of regression model using the variable as the employment rate of people employed and the GDP per inhabitant value as variable dependence was performed automatically (Figure 6), using specialized software package Eviews 5.1. Its framework is implemented least-squares method (Least Squares) as a method for estimating the model parameters, requiring only define two variables (PIB_L and E) and the constant term (C).

Using this method work, the following results have been obtained on the evolution of the phenomenon studied:

Figure 3 – The correlation between employment rate and GDP per inhabitant

Figure 4 – Parameter estimation results of the regression model that analyzes the dependency between GDP per inhabitant and population employment rate
Analyzing the results obtained it is possible to formulate practical conclusions concerning the dependence between the value of GDP per inhabitant and employment rate of the population, as follows:

• The probability that this is a correct model is relatively high - about 61%, this conclusion can be made based on the values determined using Eviews program for testing R - squared (0.6094) and Adjusted R - squared (0.5606);
• The validity of this model is confirmed by regression test values F - statistic (12.48500 - higher value than table level is considered to be the benchmark in analysis validity of econometric models) and the degree of risk almost zero (reflected by test value Prob F - statistic)
• Based on the above, we consider the regression model describing the relationship between the GDP per inhabitant and the employment rate of the population as fair, which faithfully reflect the real evolution of the two macroeconomic indicators.
• Based on estimated values previously considered regression model may be given as follows:
  \[ \text{PIB} = -633,663.4 + 11,150.08 \times \text{RO} \]
• Between the value of GDP per inhabitant and population employment rate recorded in Romania in the period 2002 - 2011 there is a significant direct relationship. Thus, we can say that a one percent increase in employment will lead to an increase with 11,150.08 currency units for the GDP/inhabitant.
• The high value of the constant term reflects that the influence of the unspecified factors in the model on resultative variable evolution (GDP per inhabitant) is significant, which leads us to conclude that the model used (although is correct) can be developed to ensure even better outcomes for activity prediction.

Between the employment rate and GDP / inhabitant there is a direct linear (Table 3, Figure 3, 4 and 5) whose trend can be evidenced by the equation:
  \[ \hat{y} = -633,663,4 + 11,150.08 \times x \]

• Correlation coefficient \( r_{y/x} = 0.7804 \) indicates a strong link between the two variables:
  \[ r = \sqrt{R^2} = \sqrt{0.609} = 0.7804; \]
• The determination report confirms that the employment rate is a determinant factor \( (R^2 > 50\%) \) for GDP growth/ inhabitant, its variation influencing the rate by 61%.
• To verify the significance of the linear correlation coefficient t test (Student) is applied, by calculating the variable \( t_{calc} \) by the relation:
  \[ t_{calc} = \frac{r_{y/x}}{\sqrt{1-r^2_{y/x}}} \times \sqrt{n-2} \]
where: \( r_{y/x} \) = linear correlation coefficient.
\( n = \) number of pairs of observed values = 10
\[
\begin{align*}
\text{t}_{\text{calc}} &= \frac{0.7804}{\sqrt{10 - 2}} = 3.531
\end{align*}
\]

\( t_{\text{calc}} \) value is compared with the critical value, the table, \( t_{\text{table}} \), that is probabilistic set to a level of significance \( \alpha \) and \( n-2 \) degrees of freedom. If
\[
\begin{align*}
|t_{\text{calc}}| &> |t_{\text{table}}|, 3.531 > 2.306
\end{align*}
\]
the hypothesis significance of correlation is checked, and if
\[
\begin{align*}
|t_{\text{calc}}| &< |t_{\text{table}}|, 3.531 < 2.306
\end{align*}
\]
the relationship is insignificant, so a key determinant will have to be found to apply the correlation method.

With a 95% probability and 8 degrees of freedom \( t_{\text{table}} \) has a value of 2.306. Because
\[
|t_{\text{calc}}| > 3.531 > 2.306
\]
we can say that the hypothesis for the significance of correlation between variables investigated is verify and and there is a connection between investigated variables significant, so \( r_{y/x} \) is statistically significant and analysis model is correctly specified.

**References**
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