STUDY ON THE QUALITY OF LIFE IN ROMANIA DURING THE PERIOD 1995-2018

Consuela DICU[1], Carmen SECARĂ [2]

[1] University of Pitești, consuela.necsulescu@upit.ro

[2] University of Pitești, carmen.secara@upit.ro

Abstract: *For any country, the well-being of its inhabitants is very important. Quality of life is a decisive concept in terms of education and health. The higher the quality of life of the population, the more the society will be able to perform economically. Within this paper, an analysis of the quality of life of the population in Romania is performed through econometric models of unifactorial and multifactorial regression. We considered Gross Domestic Product (GDP), Final Consumption / inhabitant (CF) and Gross Available Income (VDB) as the main macroeconomic indicators that determine the quality of life.*

Keywords: Profitability, Correlation, Statistical tests, Regression.

JEL Classification Codes: C01, C5, E2.

1. RESEARCH METHODOLOGY

Within this paper, an analysis of the quality of life of the population in Romania is performed through econometric models of unifactorial and multifactorial regression. We considered Gross Domestic Product / GDP (GDP), Final Consumption / GDP (CF) and Gross Disposable Income (GDP) as the main macroeconomic indicators that determine the quality of life.

The data were collected from the website of the National Institute of Statistics for a period of 24 years, 1995 - 2018. For econometric modeling we used R software.

The econometric modeling presented in this research is performed in two stages: in the first stage the identification, specification, estimation and verification of the econometric model take place; In the second stage, the econometric model is operationalized, namely its use for forecasts. A series of statistical tests are used, such as the Dickey Fuller test to verify the stationarity of the data series, the t-Student test to verify that the parameter estimators are significantly different from zero, the F test to verify that at least one coefficient is significantly different from zero, the Durbin-Watson statistical test to verify the autocorrelation of the model errors, the Jarque-Bera test used to test the normality distribution of the model errors.

2. DATA ANALYSIS AND RESULTS OF RESEARCH ACTIVITY

All three variables, Gross Domestic Product / inhabitant, Available Income and Final Consumption / inhabitant are normally distributed (the values calculated for the Jarque-Bera test and the Shapiro-Wilk test are small relative to the theoretical values for the two tests and then the hypothesis is accepted. Ho) and inhomogeneous (homogeneity coefficient values are over 50%) (see table 1).

Table 1. ***The Jarque-Bera test and the Shapiro-Wilk test for the Ho hypothesis verification - the series are normally distributed***

Variable	Testing the normality of the distribution (significance threshold α = 0.05		Homogeneity coefficient (%)
	Testul Jarque-Bera	Testul Shapiro-Wilk	
GDP / capita	JB = 1,669707 p-value = 0,4339	W = 0,92537 p-value = 0,07684	78,65
VDB	JB = 1,701530 p-value = 0,427088	W = 0,92463 p-value = 0,07401	77,93
FC/capita	JB = 1,546629 p-value = 0,461481	W = 0,92979 p-value = 0,09644	76,01

Source: Data processing from the website www.tempo online, using Rstudio software

Gross Domestic Product (GDP) is the most important macroeconomic indicator that presents the quality of life for the population of a country.

During the analyzed period, 1995-2018, the GDP / inhabitant has an increasing tendency (it increases annually with an average of 2093.71 lei / inhabitant). The study shows that by 2008, the GDP / inhabitant shows a marked increase of over 18% in 2005 and up to 124.54% in 1997. This economic growth was interrupted by the economic-financial crisis that was felt at new in the country in 2009 (GDP / inhabitant decreases by 0.83% compared to 2008). After 2011, GDP / capita is experiencing a growth period again (up to 13% - in 2017).

The financial resources are quite low which causes a reduced quality of life and financial problems in meeting the needs of the population in Romania. The disposable income, between 1995-2018, has an increasing trend (it increases on average by 2068.6 lei / year). From 1995 to 2009, the disposable income registered annual increases of over 19%. After the decreases caused by the economic-financial crisis, recorded in 2009 and 2010 (0.43% and 0.98% respectively), the disposable income exceeds the level before the crisis starting with 2011, reaching in 2018 an increase of 10, 79%.

The third macroeconomic indicator, Final Consumption / inhabitant (FC/capita), which determines the quality of life, has an increasing trend (it increases on average by 1444.83 lei / year). From the beginning of the analyzed period until 2008, the CF / inhabitant has annual increases of over 17%. In 2009, CF / inhabitant has the only decrease in the analyzed period (by 1.24%). From 2010 to 2018, this indicator increases to 9.03% (see figure 1).

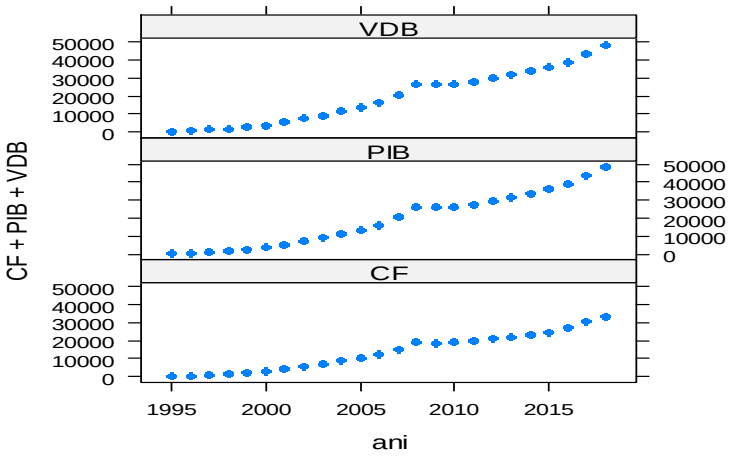


Figure 1. ***Evolution of macroeconomic indicators that influence the quality of life, between 1995 and 2018***

In conclusion, we can say that of the three macroeconomic indicators analyzed, GDP / inhabitant has the highest growth, whereas, CF / inhabitant has the lowest annual growth. In the period of economic-financial crisis, CF / inhabitant has the most marked decrease (1.24% - CF compared to 0.83% of GDP, 0.43% of GDP). In 2010, VDB is the only macroeconomic indicator that decreases in return, CF / inhabitant increases by 1.37%. In the years 2014 ÷ 2017, the increases in CF / inhabitant exceed those of GDP / inhabitant and GDP.

The stationary nature of the three series of data is studied using the Augmented Dickey - Fuller statistical test.

Analyzing the data from table 2 it is found that for the three data series, the test values are lower than the critical value for all levels of relevance and then for the most restrictive level 1% rejects the null hypothesis (Ho - data series is unsteady). So we can say that the order of integration of the data series "GDP", "VDB" and "CF" is 1 or the series is I (Anghelache et al., 2017).

Table 2. ***Results of the Augmented Dickey - Fuller statistical test for GDP / inhabitant, GDP and CF / inhabitant***

	t value	Pr(>|t|)
PIB - Augmented Dickey-Fuller test statistic	2,412	0,0301
VDB - Augmented Dickey-Fuller test statistic	2,582	0,0217
CF - Augmented Dickey-Fuller test statistic	2,893	0,0118
Test critical values:		
1% level	8,21	
5% level	5,68	
10% level	4,67	

Source: Data processing from the website www.tempo online, using Rstudio software

The regression function that describes the link between GDP (model independent variable) and VDB (model dependent variable) is of the form:

$$VDB = a + b * GDP + \varepsilon \qquad (1)$$

where ε is the residual variable

According to the data presented in the table no. 3 the hypothesis of error autocorrelation is accepted (DW = 0.32 <d1 = 1.27) and then the model must be corrected. The slope of the regression function is 0.77. After model correction, the error autocorrelation hypothesis is rejected (DW = 1.66 ≥d2 = 1.43)

Table 3. ***Durbin - Watson statistical test values***

```
//before correction
dwt(LinearModel.1)
 lag Autocorrelation D-W Statistic p-value
   1       0.7654898     0.3175327       0
 Alternative hypothesis: rho != 0
//after correction
> dwt(LinearModel.2)
 lag Autocorrelation D-W Statistic p-value
   1       0.163921       1.65785   0.304

 Alternative hypothesis: rho != 0
```

The estimator of parameter b = 0.987 is significantly different from zero because the calculated value of the test (tb = 147.98 and p = 0) is higher compared to the theoretical value of

the test (t0.05; 21 = 2.08), in contrast, the parameter estimator a = 70.23 is not significantly different from zero (ta = 1.41 <t0.05; 21 = 2.08 and p = 0.173 ≥ α = 0). Analyzing the calculated value of the F test (Fc = 21900 and p = 0) which is higher than the theoretical value of the test (F0.05; 1; 21 = 4.32), so the GDP / inhabitant is an important influence factor for VDB.

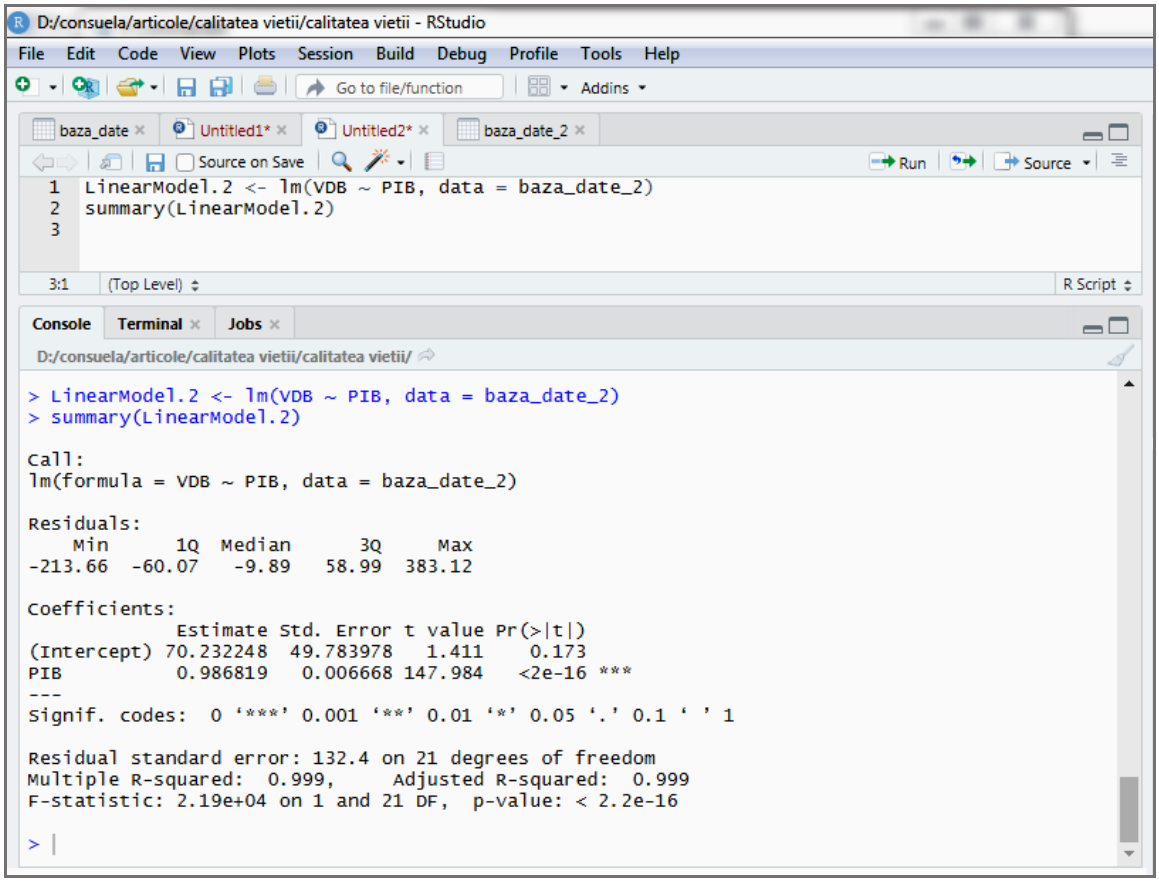


Figure 2. ***Estimation of the parameters of the econometric linear regression model between GDP and GDP / inhabitant, using the least squares (OLS) method***

The parametrized econometric model is:

VDB = 70,23 + 0,987*PIB
R = 0,999765
R^2 = 0,999754

In conclusion, we can say that there is an intense and direct connection between the two variables. 99.98% of the variation in gross disposable income is justified by the change in GDP /. The model is representative for over 99% of cases (Adjusted R = 0.999). The average annual growth of GDP / inhabitant with a leu determines, according to the regression model presented above, the increase of the gross disposable income on average with 0.987 lei / year. The combined influence of the factors not included in the presented econometric model, on the gross disposable income, is positive and is given by the increased value of parameter a.

The regression function that describes the link between GDP / inhabitant (model independent variable) and CF / inhabitant (model dependent variable) is of the form:

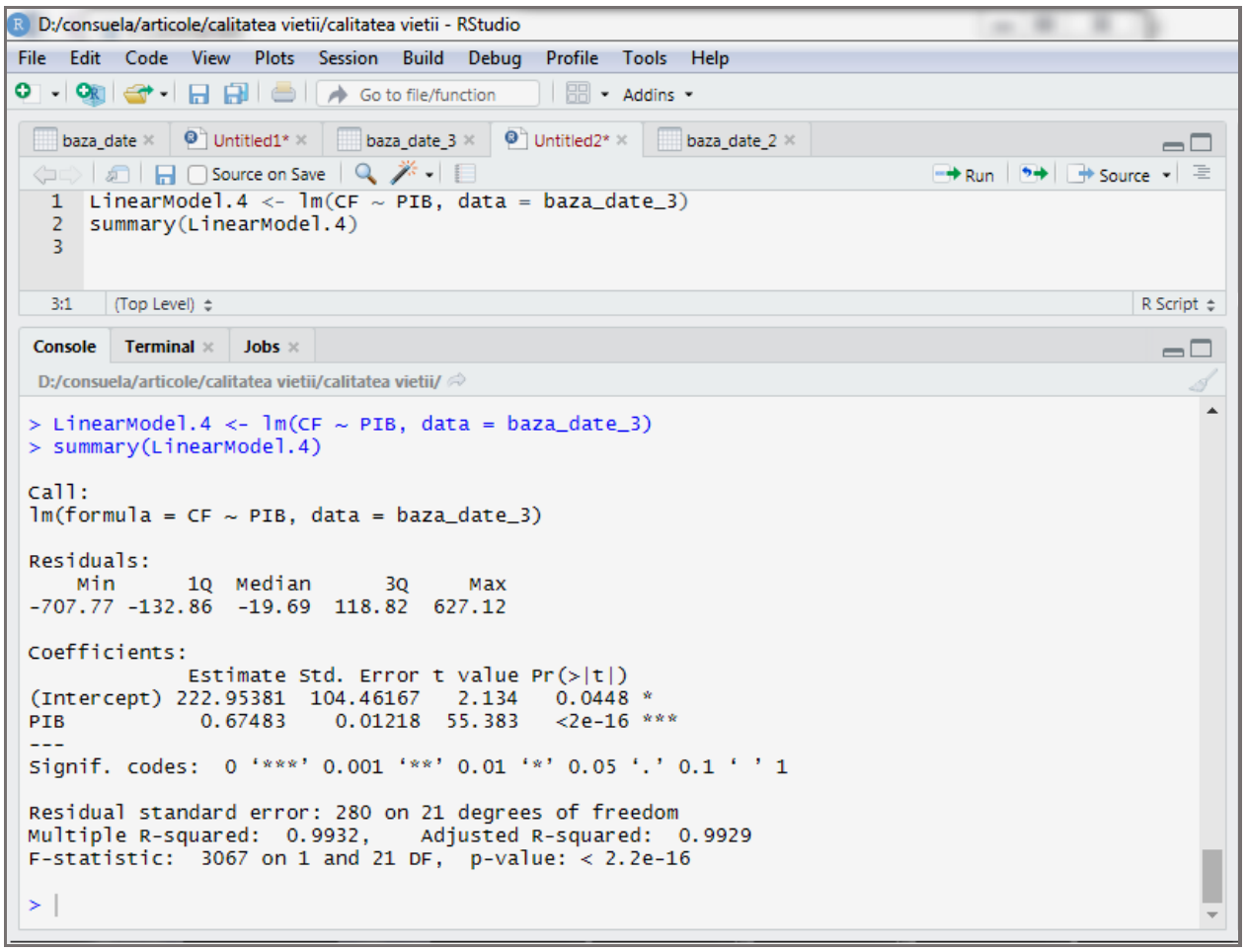
$$CF = a + b * GDP + \varepsilon \qquad (2)$$

(where ε is the residual variable).

The error autocorrelation hypothesis is accepted (DW = 0.72 <d1 = 1.27) and then the model must be corrected. The slope of the regression function is 0.72. After the model correction, the error autocorrelation hypothesis is rejected (DW = 1.71 ≥d2 = 1.43).

Table 4. ***Durbin - Watson statistical test values***

```
//before the correction
dwt(LinearModel.3)
 lag Autocorrelation D-W Statistic p-value
   1       0.7200486     0.4948036       0
 Alternative hypothesis: rho != 0
//after correction
> dwt(LinearModel.4)
 lag Autocorrelation D-W Statistic p-value
   1       0.1024647      1.709945   0.368
 Alternative hypothesis: rho != 0
```


D:/consuela/articole/calitatea vietii/calitatea vietii - RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
baza_date
Untitled1*
baza_date_3
Untitled2*
baza_date_2
Source on Save
Run
Source
1 LinearModel.4 <- lm(CF ~ PIB, data = baza_date_3)
2 summary(LinearModel.4)
3
3:1
(Top Level)
R Script
Console
Terminal
Jobs
D:/consuela/articole/calitatea vietii/calitatea vietii/
> LinearModel.4 <- lm(CF ~ PIB, data = baza_date_3)
> summary(LinearModel.4)
Call:
lm(formula = CF ~ PIB, data = baza_date_3)
Residuals:
Min 1Q Median 3Q Max
-707.77 -132.86 -19.69 118.82 627.12
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 222.95381 104.46167 2.134 0.0448 *
PIB 0.67483 0.01218 55.383 <2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 280 on 21 degrees of freedom
Multiple R-squared: 0.9932, Adjusted R-squared: 0.9929
F-statistic: 3067 on 1 and 21 DF, p-value: < 2.2e-16
>
```

**Figure 3.** ***Estimation of the parameters of the econometric linear regression model between CF / inhabitant and GDP / inhabitant, using the method of least squares (OLS)***

Both the estimator of parameter a = 222.95 and that of parameter b = 0.67 are significantly different from zero because the calculated values of the t test (ta = 2.13 with p = 0.0448 and respectively t = 55.383 with p = 0 ) are higher than the theoretical value of the test (t0.05; 21 = 2.08). The calculated value of the F test (Fc = 3067 and p = 0) is high compared to the theoretical value of the test (F0.05; 1; 21 = 4.32), so GDP / inhabitant is an important influence factor for CF / inhabitant.
```

The parametrized econometric model is:

CF = 222,95 + 0,67*PIB
R = 0,9932
R^2 = 0,9864

In conclusion, we can say that the variation of the final consumption / inhabitant is justified by the variation of the gross domestic product / inhabitant in the proportion of 98,64% and by the variation of other factors not specified in the econometric model in proportion of 1,36%. The model is representative for over 99% of cases (Adjusted R = 0.9929). The average annual growth of GDP / inhabitant with a leu determines, according to the regression model presented above, the annual increase of the final consumption / inhabitant on average with 0.67 lei / year. Parameter a is more than 100 times higher than parameter b and so it is found the presence of factors that do not appear in the econometric model and have a high and positive influence on the final consumption / inhabitant besides the gross domestic product / inhabitant.

3. CONCLUSIONS

The GDP / inhabitant has a greater influence on the GDP than the influence it has on the CF / inhabitant (99.98% compared to 98.64%), which causes a greater annual increase of the VDB in relation to the growth of CF / inhabitant (0.987 lei against 0.67 lei). The influence of the factors not included in both econometric models, on the gross disposable income and the final consumption / inhabitant, is positive for both cases, but as a value, this influence of the factors is lower on the gross disposable income compared with that on the final consumption / inhabitant.

REFERENCES

1. Anghelache, C., Manole, Al. L., Anghel, M. G., Lilea, F. P. C., Bunea, M., Analysis Models Of The Life Quality Standard In Romania, Romanian Statistical Review Supplement, Romanian Statistical Review, vol. 65(5), pp. 17-30, 2017.
2. Dohmen, T., Kriechel, B., Pfann, G., Monkey Bars and Ladders: The Importance of Lateral and Vertical Movements in Internal Labour Markets, Working paper, Maastricht University, 2001.
3. Săvoiu, Gh., Necșulescu, C., Econometrics, University Publishing House, 2009.
4. Precupeţu, I., Mihalache, F., Petrescu, C., Pop, C. E., Tufă, L., Vasile, M., Quality of Life in Romania in European context. Research report, Research Institute for the Quality of Life, 2018.
5. Secară, C., Meghișan, F., Sales Force Salary – Right or Motivation?, Supplement of Quality – Access to Success, vol. 14, S2, 2013, pp. 490-500.
6. http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table