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ECONOMETRIC MODELING OF GDP BY EMPLOYMENT AND THE VALUE OF TANGIBLE FIXED ASSESTS

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Abstract

The economic potential of a country is consistently a primary goal of existence and sustainable development, to ensure the livelihood of all residents, increase living standards. To achieve this major goal rigorous study must be complex to formulate a diagnosis and real economic status and rationale, on the basis of economic and legislative policy decisions, decisions addressing both immediate time horizons as well as longer periods of time.
In this context, we analyzed dynamics of GDP according to the dynamics of employment and dynamics of tangible fixed assets of the economy by applying a rigorous econometric modeling methodology.

Key words: *economic growth, employed population, GDP, tangible fixed assets.*

INTRODUCTION

The importance indicator "Gross Domestic Product" (GDP) to scale both economic potential and economic performance in a space related to a territorial state is well known and this indicator approach financial and economic analysis and econometric presents a reasoned understanding the significance and usefulness conclusions offered to substantiate macroeconomic decisions [3][10]. The definition given to the concept of gross domestic product, states that it is a representative macroeconomic indicator which reflects the sum of the market value of all goods and services for final consumption products in all sectors of the economy within a country within a year.
We can also specify that GDP is the sum of consumption expenditure of households and private non-profit organizations, gross investment spending, state spending, investments for storage and export earnings minus the imports value.
Size and GDP growth are directly influenced by the quantity and quality of use, both employment and tangible fixed assets of the economy. In the context of economic logic says that:
-Employment contribution by its economic performance contributes to the economic outturn GDP sized form;
-Give tangible measure of technical equipment, implementing programs to ensure the investment and development process necessary to develop technological potential economic and defining influence development and GDP growth [4].
The considerations presented can provide the opportunity to support a study likely to bring useful information to base macroeconomic decisions to promote a real economic progress [1].

MATERIALS AND METHODS

GDP growth correlation analysis based on the dynamics of population and the dynamics of tangible fixed assets by applying a methodological support of an econometric nature will be made based on the data presented in Table 1.
The analysis of scatter graph as a form of graphical representation of the interdependence between GDP and employment respectively tangible fixed assets value.(Fig.1.)

Table 1. Dynamics of GDP, employment and the value of tangible assets during 2000-2011

Year	GDP y = SER01 Mil. RON	Employment x_1 = SER02 Thousands	Value of tangible fixed assets x_2 = SER03 Mil. RON
2000	80984.6	9334	144978.2
2001	117945.8	9330	217150.6
2002	152017.0	9234	285556.4
2003	197427.6	9223	672244.7
2004	247368.0	9158	552622.2
2005	288954.6	9147	624752.8
2006	344650.6	9313	718629.7
2007	416006.8	9353	915282.8
2008	514700.0	9369	1346619.
2009	501139.4	9243	1483570.
2010	523693.3	9240	1563631.
2011	557348.2	9138	1672434.[1)]

Source: www.insse.ro

Figure 1 showed that between ser01 and ser02 was clear geometric outline form while between ser01 and ser03 is estimated with sufficient reason, that there is a linear interdependence, as it increases the value of tangible fixed assets occur an increase of GDP, justifying option to perform calculations in the following three variants:

1. Linear multifactor model:

$y = a + bx_1 + cx_2$;

2. Cobb-Douglas multifactor model:

$y = a \cdot x_1^b \cdot x_2^c$

3. Linear logarithmic multifactor model:

$\log y = a + b \log x_1 + c \log x_2$

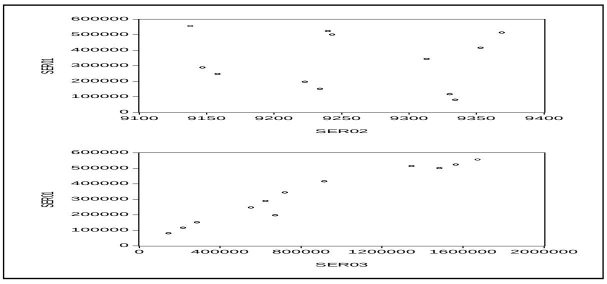

Fig. 1. Interdependence between GDP and employment and GDP and fixed assets

After comparing the results for certification of the three models, is possible to argue, on a statistical basis, the viability of a model for political and economic decisions [8][9].

Calculation of indicators needed to define mathematical model and some graphic illustration of real, estimated or residual variables are structured for each of the four econometric models [2][5][6][7]. To obtain these results we used the software Eviews.

Model 1. Linear multifactor model

Linear multifactor model was prepared by the method of least squares and has the following configuration:

$$\hat{y} = -1459592.0 + 164.5199 x_1 + 0.312052 x_2$$

Key indicators of econometric representation of this model are exposed in Table 2, plus explanatory tables 3 and 4, and graphic representations of Figure 2 to Figure 4.

Table 2. Synoptic picture of econometric representation indicators for assessing the viability of linear multifactor model of GDP by population and the value of tangible fixed assets

Dependent Variable: SER01 y = GDP				
Method: Least Squares				
Sample: 2000 - 2011: Included observations: 12				
SER01 =C(1)+C(2)*SER02+C(3)*SER03				
$y = a + bx_1 + cx_2 \rightarrow \hat{y} = -1459592.0 + 164.5199 x_1 + 0.312052 x_2$				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SER02 C(2) = „b"	164.5199	160.3575	1.025957	0.3317
SER03 C(3) = „c"	0.312052	0.024289	12.84721	0.0000
C(1) = „a"	-1459592.	1488442.	-0.980617	0.3524
R-squared	0.948862	Mean dependent var		328519.7
Adjusted R-squared	0.937498	S.D. dependent var		171870.6
S.E. of regression: $\pm\hat{\sigma}_{y.\hat{y}}$	42968.26	Akaike info criterion		24.38663
Sum squared resid	1.66E+10	Schwarz criterion		24.50786
Log likelihood	-143.3198	F-statistic		83.49748
Durbin-Watson stat	1.173942	Prob(F-statistic)		0.000002

Table 3. Real and estimated levels of the dependent variable (GDP) by population and the value of tangible fixed assets respectively beach residual term (linear multifactor model)

<table>
<tr><th>Obs.</th><th>Actual</th><th>Fitted</th><th>Residual</th><th>Residual Plot
$\pm\hat{\sigma}_{y.\hat{y}} = \pm 42968.26$
$-\hat{\sigma}_{y.\hat{y}}$ 0 $+\hat{\sigma}_{y.\hat{y}}$</th></tr>
<tr><td>2000</td><td>80984.6</td><td>121278.6</td><td>-40293.0</td><td>| * | . |</td></tr>
<tr><td>2001</td><td>117946.0</td><td>143141.</td><td>-25195.3</td><td>| . * | . |</td></tr>
<tr><td>2002</td><td>152017.0</td><td>148693.</td><td>3323.69</td><td>| . |* . |</td></tr>
<tr><td>2003</td><td>197428.0</td><td>267550.</td><td>-70122.7</td><td>|* . | . |</td></tr>
<tr><td>2004</td><td>247368.0</td><td>219528.</td><td>27839.9</td><td>| . | * . |</td></tr>
<tr><td>2005</td><td>288955.0</td><td>240227.</td><td>48727.7</td><td>| . | .* |</td></tr>
<tr><td>2006</td><td>344651.0</td><td>296832.</td><td>47819.0</td><td>| . | .* |</td></tr>
<tr><td>2007</td><td>416007.0</td><td>364778.</td><td>51228.5</td><td>| . | . * |</td></tr>
<tr><td>2008</td><td>514700.0</td><td>502010.</td><td>12690.2</td><td>| . |* . |</td></tr>
<tr><td>2009</td><td>501139.0</td><td>524016.</td><td>-22876.7</td><td>| . * | . |</td></tr>
<tr><td>2010</td><td>523693.0</td><td>548506.</td><td>-24812.4</td><td>| . * | . |</td></tr>
<tr><td>2011</td><td>557348.0</td><td>565677.</td><td>-8328.66</td><td>| . *| . |</td></tr>
<tr><td>Total</td><td>3942236.6</td><td>3942236.6</td><td>0</td><td></td></tr>
</table>

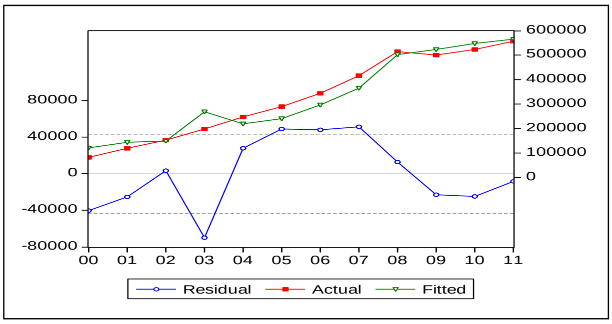

Fig. 2. Graphical representation of residue levels of real (actual) and estimated levels by multiple linear regression equation for the GDP by population and the value of tangible fixed assets (multifactor linear model)

Table 4. Synoptic picture of the results to verify the hypothesis of heteroscedasticity of the residual variable (linear multifactor model)

White Heteroskedasticity Test:				
F-statistic	2.349936	Probability		0.163950
Obs**R*-squared	7.943589	Probability		0.159372
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Sample: 2000 - 2011; Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.48E+12	5.83E+12	-0.938631	0.3842
SER02	1.16E+09	1.26E+09	0.923618	0.3913
SER02^2	-61824.54	68023.66	-0.908868	0.3985
SER02*SER03	-22.74659	12.25786	-1.855674	0.1129
SER03	223235.7	116611.1	1.914360	0.1041
SER03^2	-0.007309	0.002344	-3.118281	0.0206
R-squared	0.661966	Mean dependent var		1.38E+09
Adjusted R-squared	0.380270	S.D. dependent var		1.45E+09
S.E. of regression	1.14E+09	Akaike info criterion		44.86107
Sum squared resid	7.86E+18	Schwarz criterion		45.10353
Log likelihood	-263.1664	*F*-statistic		2.349936
Durbin-Watson stat	2.946662	Prob (*F*-statistic)		0.163950

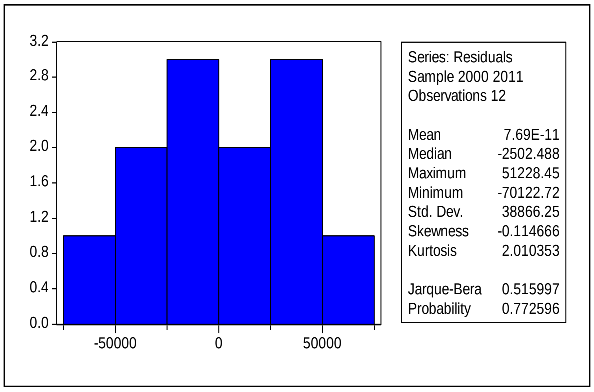

Fig.3. Normality test for distribution of the residual variable based on statistical criteria Jarque-Bera (multifactor linear model)

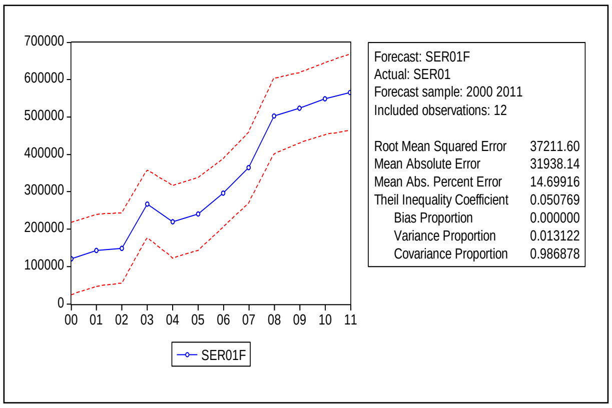

Fig. 4. Graphical representation of estimated level of GDP (SER02F = $\hat{y}$) and limits within ± 2.228 estimation of mean error based on Student repartition law with 5% (linear multifactor model) $(\pm t_{q=0.05;\ f=n-k=12-2} \cdot \hat{\sigma}_{y;\hat{y}} = \pm 2.228 \cdot 42968.26)$

Model 2. Multifactor Cobb-Douglas model

Cobb-Douglas multifactor model was elaborated using method of least squares and has the following configuration:

$$\hat{y} = 0.001530 \cdot x_1^{0.990995} \cdot x_2^{0.745461}.$$

Key indicators of econometric representation of this model are exposed in Table 5, plus explanatory tables 6 and 7, and graphic representations of Figure 5 and Figure 6.

Table 5. Synoptic picture of econometric representation indicators for assessing the viability of Cobb-Douglas model of GDP by population and the value of tangible fixed assets

Dependent Variable: SER01= y = GDP				
Method: Least Squares				
Sample: 2000 – 2011; Included observations: 12				
Convergence achieved after 500 iterations				
SER01 =C(1)*SER02^C(2)* SER03^C(3)				
$y = a \cdot x_1^b \cdot x_2^c \rightarrow \hat{y} = 0.001530 \cdot x_1^{0.990995} \cdot x_2^{0.745461}$				
	Coefficient	Std. Error	*t*-Statistic	Prob.
C(1) = „*a*”	0.001530	0.050030	0.030586	0.9763
C(2) = „*b*”	0.990995	3.558445	0.278491	0.7869
C(3) = „*c*”	0.745461	0.069116	10.78564	0.0000
R-squared	0.957255	Mean dependent var		328519.7
Adjusted R-squared	0.947756	S.D. dependent var		171870.6
S.E. of regression: $\pm \hat{\sigma}_{y.\hat{y}}$	39284.36	Akaike info criterion		24.20736
Sum squared resid	1.39E+10	Schwarz criterion		24.32859
Log likelihood	-142.2442	Durbin-Watson stat		1.428700

Table 6. Real and estimated levels of the dependent variable (GDP) by population and the value of tangible fixed assets respectively beach residual term (Cobb-Douglas model)

Obs	Actual	Fitted	Residual	Residual Plot $\pm \hat{\sigma}_{y.\hat{y}} = \pm 39284.36$; $-\hat{\sigma}_{y.\hat{y}}$ 0 $+\hat{\sigma}_{y.\hat{y}}$
2000	80984.6	92602.7	-11618.1	| . * | . |
2001	117946.	125094.	-7148.14	| . *| . |
2002	152017.	151860.	157.045	| . * . |
2003	197428.	287157.	-89729.2	|* . | . |
2004	247368.	246398.	970.020	| . * . |
2005	288955.	269673.	19281.3	| . | * . |
2006	344651.	304720.	39931.1	| . | * |
2007	416007.	366485.	49522.3	| . | . * |
2008	514700.	489550.	25149.9	| . | * . |
2009	501139.	519190.	-18050.7	| . * | . |
2010	523693.	539763.	-16069.2	| . * | . |
2011	557348.	561311.	-3963.04	| . *| . |

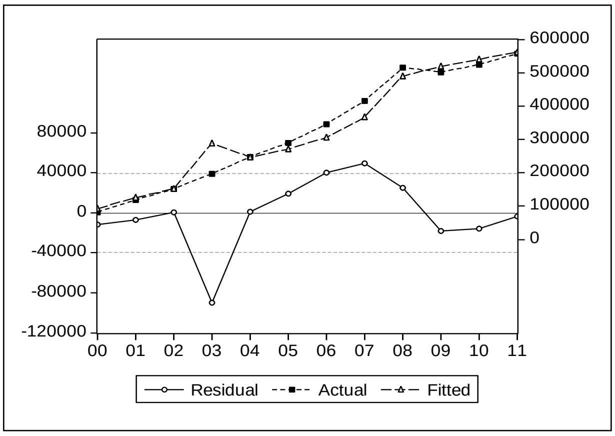

Fig. 5. Graphical representation of residue levels of real (actual) and estimated levels by Cobb-Douglas regression equation for the GDP by population and the value of tangible fixed assets (Cobb-Douglas model)

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Table 7. Synoptic picture of the results to verify the hypothesis of heteroscedasticity of the residual variable (Cobb-Douglas model)

White Heteroskedasticity Test:				
F-statistic	1.024963	Probability		0.478462
Obs**R*-squared	5.527983	Probability		0.354887
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Sample: 2000 - 2011; Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.31E+13	1.16E+13	-1.126655	0.3029
SER02	2.81E+09	2.51E+09	1.117920	0.3064
SER02^2	-150613.0	135761.5	-1.109394	0.3097
SER02*SER03	-26.27037	24.46421	-1.073828	0.3242
SER03	260184.2	232732.3	1.117955	0.3063
SER03^2	-0.009351	0.004678	-1.998876	0.0926
R-squared	0.460665	Mean dependent var		1.16E+09
Adjusted R-squared	0.011220	S.D. dependent var		2.30E+09
S.E. of regression	2.28E+09	Akaike info criterion		46.24316
Sum squared resid	3.13E+19	Schwarz criterion		46.48561
Log likelihood	-271.4590	*F*-statistic		1.024963
Durbin-Watson stat	2.262536	Prob (*F*-statistic)		0.478462

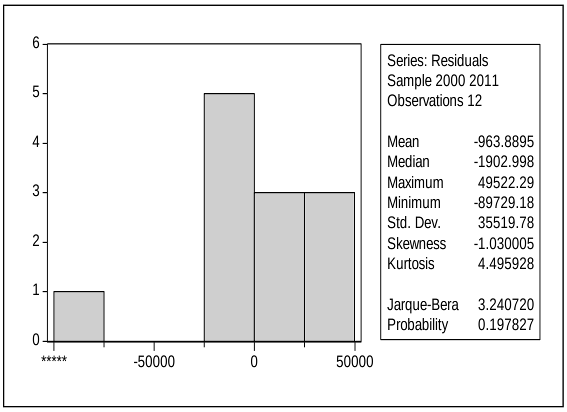

Fig. 6. Normality test for distribution of the residual variable based on statistical criteria Jarque-Bera (Cobb-Douglas model)

Model 3. Linear logarithmic multifactor model

By applying the method of least squares linear multifactor model is formalized through a logarithmic regression equation which has the following configuration:

$$log\ \hat{y} = -35.40121 + 4.084655\, logx_1 + 0.793360\, logx_2$$

Key indicators of econometric representation of this model are exposed in Table no.8, plus explanatory tables 9 and 10, as well as the graphical representation of Figure 7 and figure 8. It is noted that the logarithmic multifactor model present some difficulties of comparability with other models due to the logarithmic form of representation of expressed econometric indicators.

In Table 8 are presented variables of studied system in logarithmic form on which we proceeded to determine the representation econometric indicators.

Table 8. Dynamics of GDP, employment and the value of tangible fixed assets during the period 2000-2011 (in logarithmic form)

Obs	SER04 = logser01	SER05 = logser02	SER06 = logser03
2000	11.30201	9.141419	11.88434
2001	11.67798	9.140990	12.28835
2002	11.93175	9.130648	12.56219
2003	12.19313	9.129456	13.41838
2004	12.41863	9.122383	13.22243
2005	12.57402	9.121181	13.34511
2006	12.75029	9.139167	13.48510
2007	12.93846	9.143452	13.72699
2008	13.15134	9.145162	14.11311
2009	13.12464	9.131622	14.20996
2010	13.16866	9.131297	14.26252
2011	13.23095	9.120197	14.32979

Note: Logarithms are calculated with base „e", (e = 2,718281828)

Table 9. Synoptic picture of econometric representation indicators for assessing the viability of logarithmic model of GDP by population and the value of tangible fixed assets

Dependent Variable: SER04				
Method: Least Squares				
Sample: 2000 – 2011; Included observations: 12				
SER04 = C(1)+C(2)*SER05 + C(3)*SER06				
Log ser01 = C(1)+C(2)*log ser02+C(3)*log ser03				
$log\hat{y} = a \cdot + b\, log \cdot x_1 + c\, logx_2 \rightarrow log\ \hat{y} = -35.40121 + 4.084655\, logx_1 + 0.7$				
Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
SER02 C(2) = „*b*"	4.084655	4.910421	0.831834	0.4270
SER03 C(3) = „*c*"	0.793360	0.054111	14.66183	0.0000
C(1) = „*a*"	-35.40121	45.02827	-0.786200	0.4520
R-squared	0.961174	Mean dependent var		12.53849
Adjusted *R*-squared	0.952546	S.D. dependent var		0.644769
S.E. of regression: $\pm log_e\hat{\sigma}_{y.\hat{y}}$	0.140457	Akaike info criterion		-0.875517
Sum squared resid	0.177553	Schwarz criterion		-0.754291
Log likelihood	8.253105	*F*-statistic		111.4009
Durbin-Watson stat	2.072009	Prob (F-statistic)		0.000000

Table 10. Real and estimated levels of the dependent variable (GDP) by population and the value of tangible fixed assets respectively beach residual term (logarithmic model)

<table>
<tr><th>Obs</th><th>Actual</th><th>Fitted</th><th>Residual</th><th>Residual Plot
$\pm log_e\hat{\sigma}_{y.\hat{y}} = \pm 0.140457$
$-log_e\hat{\sigma}_{y.\hat{y}}$ 0 $+log_e\hat{\sigma}_{y.\hat{y}}$</th></tr>
<tr><td>2000</td><td>11.3020</td><td>11.3669</td><td>-0.06488</td><td>| . *| . |</td></tr>
<tr><td>2001</td><td>11.6780</td><td>11.6857</td><td>-0.00768</td><td>| . * . |</td></tr>
<tr><td>2002</td><td>11.9317</td><td>11.8607</td><td>0.07108</td><td>| . |* . |</td></tr>
<tr><td>2003</td><td>12.1931</td><td>12.5351</td><td>-0.34194</td><td>|* . | . |</td></tr>
<tr><td>2004</td><td>12.4186</td><td>12.3507</td><td>0.06791</td><td>| . |* . |</td></tr>
<tr><td>2005</td><td>12.5740</td><td>12.4431</td><td>0.13088</td><td>| . | * |</td></tr>
<tr><td>2006</td><td>12.7503</td><td>12.6277</td><td>0.12262</td><td>| . | *. |</td></tr>
<tr><td>2007</td><td>12.9385</td><td>12.8371</td><td>0.10138</td><td>| . | *. |</td></tr>
<tr><td>2008</td><td>13.1513</td><td>13.1504</td><td>0.00094</td><td>| . * . |</td></tr>
<tr><td>2009</td><td>13.1246</td><td>13.1719</td><td>-0.04729</td><td>| . *| . |</td></tr>
<tr><td>2010</td><td>13.1687</td><td>13.2123</td><td>-0.04364</td><td>| . *| . |</td></tr>
<tr><td>2011</td><td>13.2309</td><td>13.2203</td><td>0.01062</td><td>| . * . |</td></tr>
</table>

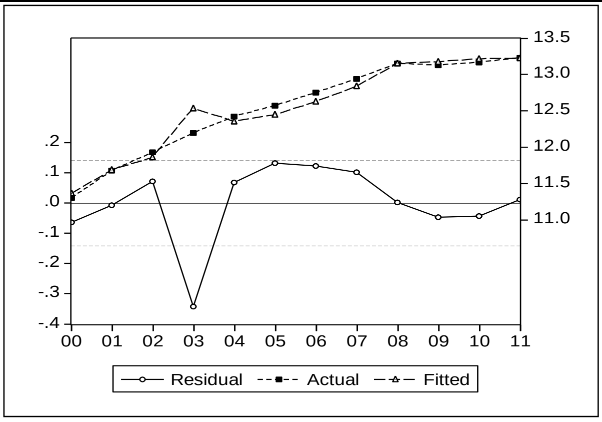

Fig. 7. Graphical representation of residue levels of real (actual) and estimated levels by logarithmic regression equation for the GDP by population and the value of tangible fixed assets (logarithmic model)

Table 11. Synoptic picture of the results to verify the hypothesis of heteroscedasticity of the residual variable (logarithmic model)

White Heteroskedasticity Test:				
F-statistic	0.532996	Probability		0.716554
Obs**R*-squared	2.801562	Probability		0.591563
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Sample: 2000 – 2011; Included observations: 12				
Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
C	-249.9121	384.5148	-0.649942	0.5365
SER02	26.61431	41.62250	0.639421	0.5429
SER02*SER03	-1.958150	3.036022	-0.644972	0.5395
SER03	18.92095	28.38059	0.666686	0.5263
SER03^2	-0.039092	0.030833	-1.267845	0.2454
R-squared	0.233464	Mean dependent var		0.014796
Adjusted *R*-squared	-0.204557	S.D. dependent var		0.032672
S.E. of regression	0.035859	Akaike info criterion		-3.524119
Sum squared resid	0.009001	Schwarz criterion		-3.322074
Log likelihood	26.14471	*F*-statistic		0.532996
Durbin-Watson stat	2.389049	Prob (*F*-statistic)		0.716554

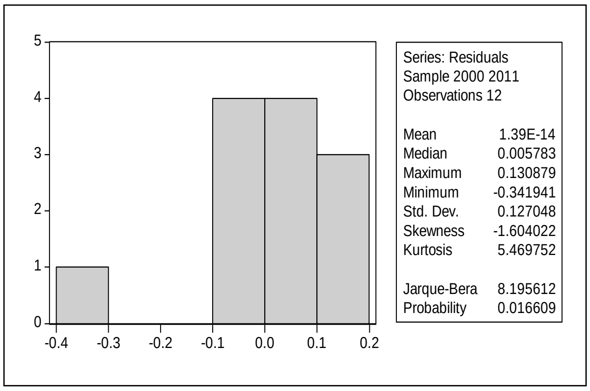

Fig. 8. Normality test for distribution of the residual variable based on statistical criteria Jarque-Bera (logarithmic model)

RESULTS AND DISCUSSIONS

After processing statistics for the variables considered to form an interdependent system, GDP, employment and the value of tangible fixed assets, were obtained the results listed in Table 2 for Model 1, in Table 6 for model 2 and in Table 11 for model 3.

Interpretation of the results refer to indicators representing econometric on which it is estimated that certification of the quality and durability of the three designs which are exposed to a comparative form in Table 12 [11].

Table 12. Table of comparative synthetic viability results of three models

Econometric indicators	Model 1	Model 2	Model 3
Mathematic formula of model	Linear multifactor $\hat{y} = -1459592.0 + 164.5199x_1 + 0.312052x_2$	Cobb-Douglas $\hat{y} = 0.001530 \cdot x_1^{0.990995} \cdot x_2^{0.745461}$	logarithmic $log\ \hat{y} = -35.40121 + 4.084655\ log x_1 + 0.793360\ log x_2$
R-squared	0.948862	0.957255	0.961174
R-raportul de corelaţie	0.974095	0.978394	0.980395
S.E. of regression: absolute relative (%)	42968.26 13.08%	39284.36 11.96%	(log_e) 0.140457 1.12%
Durbin-Watson stat D-W (q=0,05): 1,54<DW<4-1,54 (q=0,01): 1,25<DW<4-1,25	1.173942	1.428700	2.072009
Jarque – Bera Probability	0.515997 0.772596	3.240720 0.197827	8.195612 0.016609
Heteroskedasticity Test	homoscedasticity	homoscedasticity	Homoscedasticity
Akaike info criterion	24.38663	24.20736	(log_e) -0.875517
Schwarz criterion	24.50786	24.32859	(log_e) -0.754291
F-statistic	83.49748		111.4009
Prob (*F*-statistic)	0.000002		0.000000

Interpretation of results in Table 15, and a summary in the other tables and graphical presentations allowed drawing the following conclusions.

CONCLUSIONS

The ratio of the correlation between the size of 0.974095 and 0.980395, confirming the existence of a strong correlation between the variables studied system in all three variants of econometric models. This finding is supported in graphical form of fig. 2, 4 and 5;

Multiple determination coefficients (R - squared) shows that over 95% of GDP change is determined by the change of employment and that value of tangible fixed assets. The difference from 100% is the relative size of the influence of other factors that were not included in the models;

Based on the information defined by the size ratio of the correlation can be established the following order of viability of three models: the first is positioned the logarithmic linear multifactor model followed by the Cobb-Douglas model and finally multifactor linear

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model. It is noted, however, that the differences are not significant in these circumstances the light of this criterion, the three models are considered equivalent. The criterion F (Fisher distribution) confirmed that all three models, ratio of correlation is significantly different from zero;

The variable x_2, the value of fixed assets is certified in statistical terms as significant in all three econometric models. This variable is associated with a regression coefficient that is affected by a very low estimate of the standard error and that the criterion t (Law Student distribution) is significantly different from zero for a significance level of less than 5%. This finding warrants priority to act by applying economic policy measures to increase more sustained value tangible fixed assets through investment;

Linear multifactor model dimensioning an estimate of 0.312052 GDP change if variable x_2 (the value of tangible fixed assets) is amended with a monetary unit with the restriction to remain at a constant level of variable x_1 (number of employees)

In the context of the models developed, the variable x_1 (employment) and the regression coefficient that is assigned, do not have a conclusive significance in statistical terms, based on testing which is subjected by the criterion t;

Estimate the standard error of the regression equation has the minimum value, both in absolute and relative, in the case of the Cobb -Douglas, which can be a criterion for assessing the viability of this model;

Durbin -Watson statistic criterion confirms the absence of the phenomenon of autocorrelation values of the error term in the Durbin -Watson distribution with 5% significance threshold, only logarithmic linear multifactor model, but for a significance level of 1% is considers that the residual variable is not auto-correlated for the Cobb -Douglas model. Models that do not meet the non-auto-correlated residual values can affect the correct interpretation of following econometric indicators:

-Estimate the standard deviation of the equation is less than the actual value and therefore the coefficient of determination and correlation report that are oversized. In these conditions the intensity of the interdependence of the variables of the system is higher than in reality;

-Criterion t used to test the significance of the parameters estimated values of the regression equation is not conclusive. In this case the t - statistic values are overstated , which would better confirm the significance of the parameters;

The distribution of the residual variable in the criterion Jarque-Bera is known, statistically speaking, that does not differ significantly from the normal distribution for linear multifactor models, because in these cases the corresponding probability is over threshold 60% accepted. Where not confirming the hypothesis of normality of the distribution of the error term, the quality parameters of the regression equation to be of maximum likelihood and the calculation of confidence intervals is assessed as inconclusive or compromised;

Homoscedasticy residual variable on the basis of test White, is proven for each of the three patterns. Under these conditions specifying the following findings:

-Dispersion error is constant;

-Application of the "t Criterion" to check the significance of the regression equation parameters is fully conclusive;

Statistical information criteria, Akaike Information Criterion and Schwarz Criterion, support sustainability of Cobb-Douglas model and logarithmic model because of the lowest values;

The results shown in ordinary coefficients of linear correlation matrix (Table 12) invalidates multi-collinearity phenomenon, that variable x_1 does not correlate with the variable x_2, according to the Klein test, as $R^2_{y;x_1,x_2} > r_{x_1,x_2}$.

Table 12. Ordinary coefficients of linear correlation matrix

	y	x_1	x_2
Y	1.000000	-0.105103	0.971021
x_1	-0.105103	1.000000	-0.186486
x_2	0.971021	-0.186486	1.000000

By fulfillment of this condition, the parameters of the regression equation show a good representation of the econometric model capacity.

Identified findings offer a practical, freedom of choice, with reasonable confidence, for any of the models developed. There is however possible to make a recommendation for priority application, the extrapolation calculations, the model formalized by multiple linear regression equation, by considering econometric support information.

Multifactor Cobb-Douglas models and linear logarithmic model, attaches greater importance to variable "value tangible fixed assets" compared to other models, which may be relatively unrealistic conditions of the country.

Regarding "employment" variable expressed position that locates the three models is affected by the failure to confirm its statistical significance. Population growth while reducing unemployment and increasing social productivity will reposition the importance of this variable.

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