ECONOMETRIC STUDY OF NET PROFIT GROWTH BY EXPENDITURE DYNAMICS WITH STAFF AND DYNAMICS OF VALUE ADJUSTMENTS OF TANGIBLE AND INTANGIBLE ASSETS

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Abstract:

    Increasing economic and financial performance, as the primary goal of all economic studies, require rigorous decision making, both current ones and those strategic.

    News management concerns strengthening and developing business logic involves a scientific substantiation of the best decisions to ensure that growth and ensuring financial performance and strengthen economic and financial conditions. The major goal can be achieved only by adopting sustainable solutions investigation based statistical and mathematical logic proper. In this context, the analysis of net profit growth by expenditure growth dynamics of staff and value adjustments on tangible and intangible assets, the economic operator.

    Key words: *economic dynamics, management performance; financial growth; substantiate decisions.*

    JEL classification: E24; F43.

INTRODUCTION

Net profit is an indicator that summarizes the most expressive form of economic and financial performance of an economic operator. The size and dynamics of net profit are directly determined by how they were using the main factors of the economic process, the way in which human potential is harnessed and material available to an operator. In the context of economic logic states that expenditure on staff and that the economic operator with gradual transfer of value of tangible and intangible fixed assets in the amount of expenses related to the economic process are expressions effort to achieve the final result table materialized in net profit (Aceleanu and Serban, 2009). From the point of view of economic motivation may be mentioned also that:
- Staff costs consist of labor value of the contribution to the result in the form of economic production, turnover and profit realization respectively;
- Value adjustments on tangible and intangible main component operating expenses Depreciation of tangible and intangible fixed assets are a measure of technical equipment, implementing programs to ensure investment and development necessary to develop technological potential economic process. These assets shall forward the value, in stages, the economic outturn expenditure by the amount of depreciation, unless there are other implications resulting from the impairment of these assets (Vasile et al., 2013).

These considerations may provide the opportunity to support a study likely to bring useful information to base management decisions to promote a functional and financial performance improvement of the economic operator.

Correlation Analysis of net profit growth by expenditure dynamics and dynamic staff, who value adjustments on tangible and intangible assets by applying a methodological support of an econometric nature, will be made based on data presented in Table 1.

Table 1
Dynamics of net profit, staff costs and the adjustment value of tangible and intangible assets

Year	Net profit (thousands RON) y = SER 01	Staff costs (thousands RON) x_1 = SER 02	Adjustment value of tangible and intangible assets (thousands RON) x_2 = SER 03

2000	20.430,0	30.602,0	10.762,0
2001	20.625,0	30.820,0	10.921,0
2002	20.943,0	30.934,0	11.032,0
2003	21.650,0	31.425,0	11.340,0
2004	21.320,0	31.740,0	11.140,0
2005	21.489,0	31.815,0	11.272,0
2006	22.145,0	31.840,0	11.915,0
2007	22.780,0	32.245,0	12.340,0
2008	22.530,0	32.416,0	12.070,0
2009	22.998,0	32.612,0	12.900,0
2010	23.589,0	33.024,0	13.560,0
2011	24.100,0	33.510,0	13.720,0
Total	**264.599,0**	**382.983,0**	**142.972,0**

Graphical representation of the correlation between net profit and growth dynamics of staff costs and the dynamics of value adjustments relating tangible and intangible assets
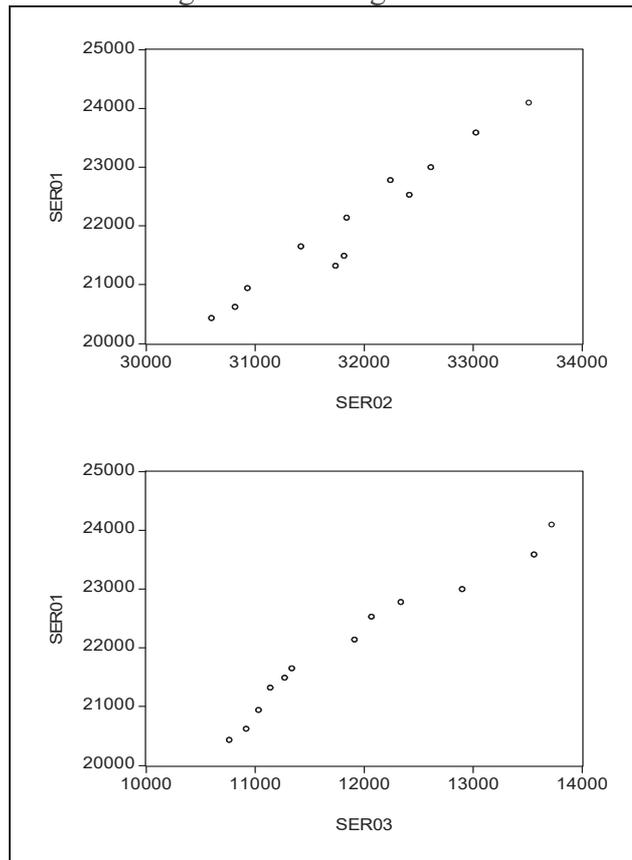

Figure 1. and Figure 2.

2. Defining the econometric model

Graphical representation of the correlation between variables system under study (Figure 1., and Figure 2.) provide suggestive information through the arrangement of point cloud, the shape of interdependence both between the SER 01 and SER 02 and between SER 01 and SER 03. In these circumstances it opts for a multiple linear regression equation has the general form:

$$y = a + bx_1 + cx_2.$$

Parameter estimation of linear multiple regression equation considered analytical form interdependent system studied is performed using the method of least squares and obtain the following system of equations:

$$\begin{cases} \Sigma y = na + b \Sigma x_1 + c \Sigma x_2 \\ \Sigma x_1 y = a \Sigma x_1 + b \Sigma x_1^2 + c \Sigma x_1 x_2 \\ \Sigma x_2 y = a \Sigma x_2 + b \Sigma x_1 x_2 + c \Sigma x_2^2 \end{cases}$$

$$\begin{cases} 264.599 = 12 \cdot a + 382.983 \cdot b + 142.972 \cdot c \\ 8.456.007..999 = 382.983 \cdot a + 12.231.789.511 \cdot b + 4.572.545.072 \cdot c \\ 3.165.489.284 = 142.972,0 \cdot a + 4.572.545.072 \cdot b + 1.714.996.818 \cdot c \end{cases}$$

After solving this system of equations is obtained econometric model,

$$\hat{y} = -5.022,571 + 0,621789x_1 + 0,606659x_2$$

Table 2
Table intermediate calculations necessary for solving the system of equations

Year	$x_1 y$	x_1^2	x_2^2	$x_1 x_2$	$x_2 y$
2000	625.198.860	936.482.404	115.820.644	329.338.724	219.867.660
2001	635.662.500	949.872.400	119.268.241	336.585.220	225.245.625
2002	647.850.762	956.912.356	121.705.024	341.263.888	231.043.176
2003	680.351.250	987.530.625	128.595.600	356.359.500	245.511.000
2004	676.696.800	1.007.427.600	124.099.600	353.583.600	237.504.800
2005	683.672.535	1.012.194.225	127.057.984	358.618.680	242.224.008
2006	705.096.800	1.013.785.600	141.967.225	379.373.600	263.857.675
2007	734.541.100	1.039.740.025	152.275.600	397.903.300	281.105.200
2008	730.332.480	1.050.797.056	145.684.900	391.261.120	271.937.100
2009	750.010.776	1.063.542.544	166.410.000	420.694.800	296.674.200

2010	779.003.136	1.090.584.576	183.873.600	447.805.440	319.866.840
2011	807.591.000	1.122.920.100	188.238.400	459.757.200	330.652.000
Total	8.456.007.999	12.231.789.511	1.714.996.818	4.572.545.072	3.165.489.284

3. Calculation of key indicators econometric representation

Correlation ratio:

$$R_{y \cdot x_1,x_2} = \sqrt{R^2_{y.x_1,x_2}} = \sqrt{1 - \frac{\Sigma(y-\hat{y})^2}{\Sigma(y-\bar{y})^2}} = \sqrt{0,982927} = 0,99143$$

We calculate *F*-statistic to verify statistic signification of correlation ratio using „*F Test*".

$$F - \text{statistic} = \frac{\Sigma(\hat{y}-\bar{y})^2}{k-1} : \frac{\Sigma(y-\hat{y})^2}{n-k} = \frac{14.871.826,7}{3-1} : \frac{258.318,3}{12-3} =$$

$$= \frac{7.435.913,35}{28.702,033} = 259,0727 \,,$$

where *n* is number of observations and *k* is number of parameters (coefficients) from regression equation.

$$\Sigma(\hat{y} - \bar{y})^2 + \Sigma(y - \hat{y})^2 = \Sigma(y - \bar{y})^2$$
$$14.871.826,7 + 258.318,3 = 15.130.145,0$$

Expression relative standard error estimation of the regression equation:

$$\hat{V}_{y.\hat{y}} = \frac{\hat{\sigma}_{y.\hat{y}}}{\bar{y}} \cdot 100 = \frac{169,4168}{22.049,92} \cdot 100 = 0,76833\%$$

Durbin – Watson statistic,

$$DW = \frac{\sum_{t=2}^{n}(u_t - u_{t-1})^2}{\sum_{t=1}^{n}u_t^2} = 1,557420$$

where: $u_t = (y - \hat{y})_t$ is the error (residual variable)

Theil coefficient of irregularity (inequality) (as shown in Figure 3.)

$$Th = \frac{\sigma_{y,\hat{y}}}{\sqrt{\frac{\Sigma \hat{y}^2}{n}} + \sqrt{\frac{\Sigma y^2}{n}}} \cdot 100 = 0,3323\%$$

Table 3

Synoptic picture of the results showing the viability of dynamic econometric model of the correlation between net income by expenditure dynamics and dynamic staff who value adjustments of tangible and intangible

Dependent Variable: Net profit = SER01 = y				
Method: Least Squares				
Sample: 2000 – 2011; Included observations: 12				
Variable	Coefficient	Std. Error	*t*-Statistic	(Prob.)
SER02 - b	0,621789	0,178299	3,487346	0,0069
SER03 - c	0,606659	0,155348	3,905156	0,0036
C - a	-5.022,571	3.981,915	-1,261346	0,2389
(*R*-squared) $R^2_{y.x_1,x_2}$	0,982927	Mean dependent var $\bar{y}$		22.049,92
Adjusted *R*-squared	0,979133	S.D. dependent var		1.172,803
S.E. of regression $\pm\hat{\sigma}_{y,\hat{y}}$	169,4168	Akaike info criterion		13,31492
Sum squared resid $\Sigma(y-\hat{y})^2$	258.318,3	Schwarz criterion		13,43615
Log likelihood	-76,88951	*F*-statistic		259,0727
Durbin-Watson stat : DW	1,557420	*Prob. F*-statistic		0,000000

Note: The indicators presented in synoptic picture of the results were obtained using the software Eviews.

Table 4

Series of actual levels, the estimated levels of the dependent variable (net profit) by expenditure dynamics of staff and dynamics of value adjustments on tangible and intangible assets and residual plot

Year (Obs.)	Actual level of net profit (y) (Actual)	Estimated level of net profit based on regression equation $(\hat{y})$ (Fitted)	Series of residual levels of errors $(u = y - \hat{y})$ (Residual)	Residual Plot $\pm\hat{\sigma}_{y,\hat{y}} = \pm169,4168$ $-\hat{\sigma}_{y,\hat{y}} \quad 0 \quad +\hat{\sigma}_{y,\hat{y}}$

2000	20.430,0	20.534,3	-104,279	| . * | . |
2001	20.625,0	20.766,3	-141,287	| . * | . |
2002	20.943,0	20.904,5	38,4894	| . | * . |
2003	21.650,0	21.396,7	253,340	| . | . * |
2004	21.320,0	21.471,2	-151,192	| .* | . |
2005	21.489,0	21.597,9	-108,905	| . * | . |
2006	22.145,0	22.003,5	141,468	| . | * . |
2007	22.780,0	22.513,2	266,814	| . | . * |
2008	22.530,0	22.455,7	74,2859	| . | * . |
2009	22.998,0	23.081,1	-83,1120	| . * | . |
2010	23.589,0	23.737,7	-148,684	| .* | . |
2011	24.100,0	24.136,9	-36,9390	| . * | . |
Total	264.599,0	264.599,0	0,0000	

Graphical representation of the series with estimated values of net profit growth by staff expenditure dynamics and dynamic of value adjustments on tangible and intangible assets (SER01F) and limits which fall under the average a $\pm2,262$ error estimations of equation multiple linear regression (based on the Student distribution with bilateral arrangement signification)

$$(\pm t_{q = 0,05; f = n - k = 12 - 3} \cdot \hat{\sigma}_{y; \hat{y}} = \pm2,262 \cdot 169,4168)$$
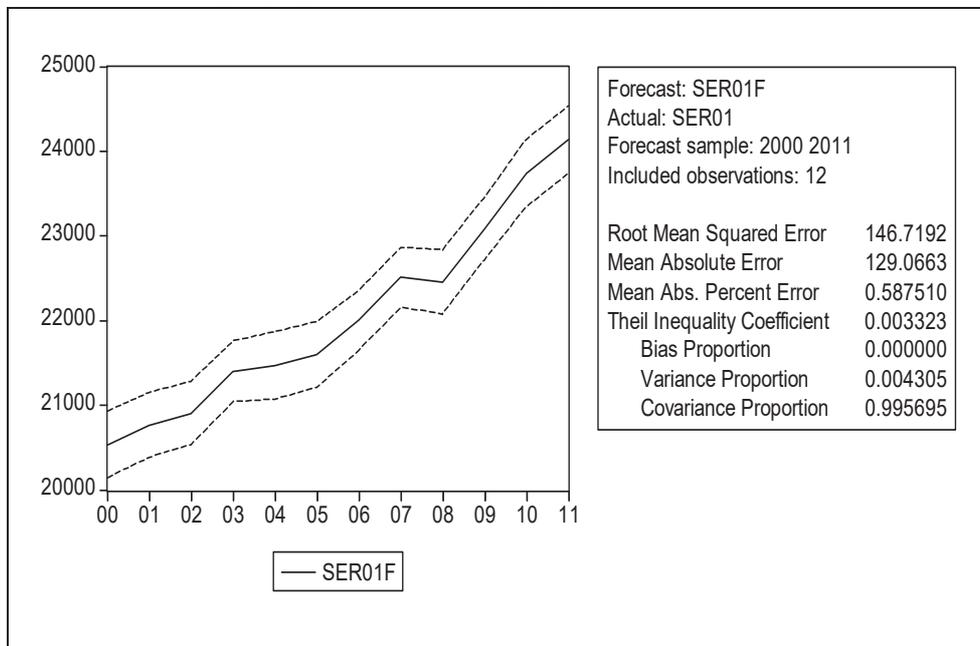
Figure 3. Graphical presentation of residue levels of real (actual) and estimated levels of net profit growth by staff expenditure dynamics and dynamic of value adjustments of tangible and intangible assets
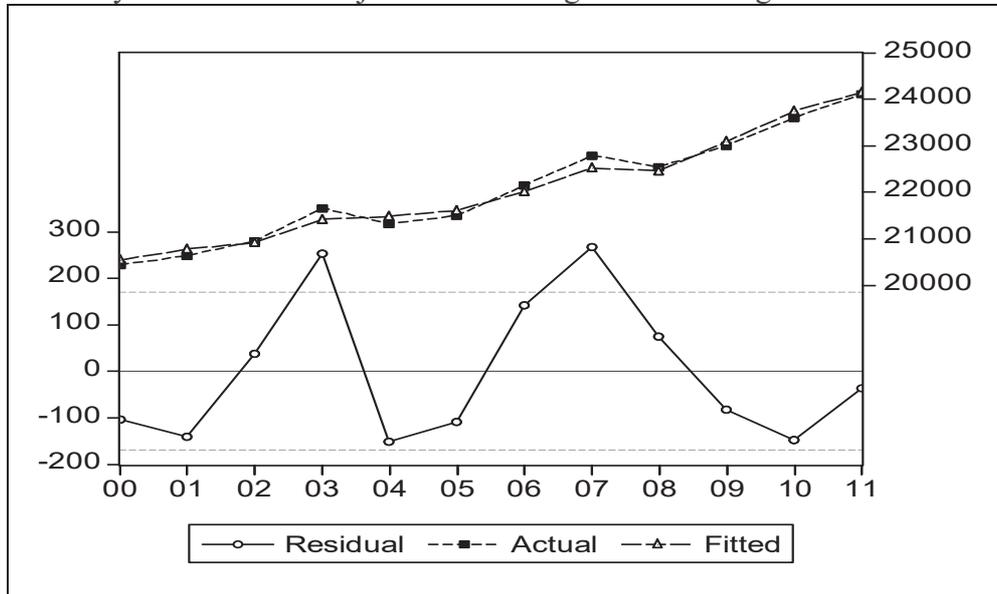

Figure 4. Statistical description of the residual variable and test for normality of the distribution of the residual variable
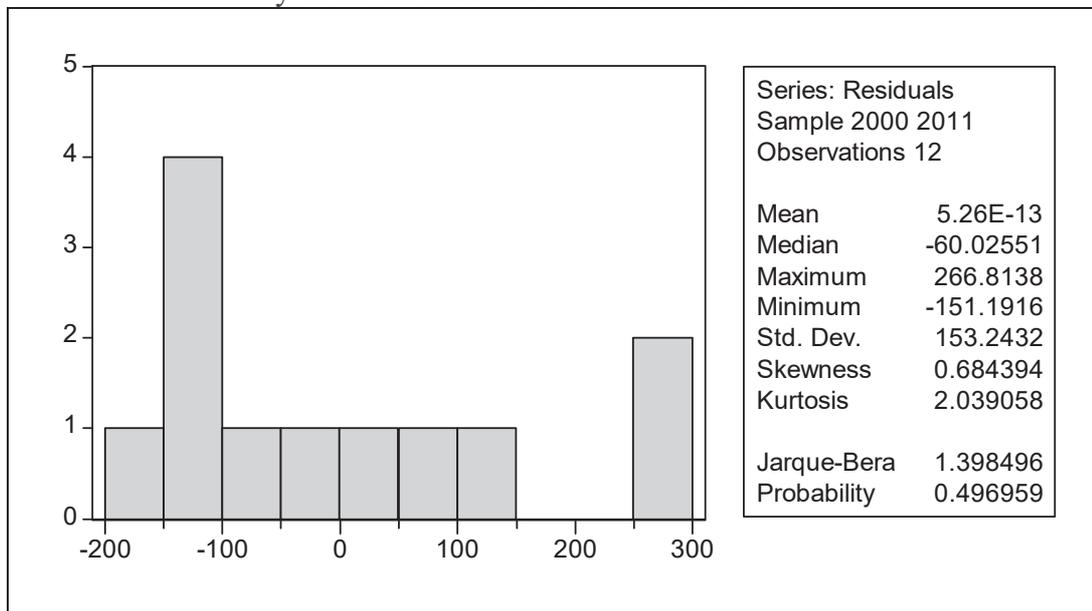

Figure 5.

Indicators needed to carry out the test of normality of the distribution of the residual variable are shown in Fig. 5:

Jarque – Bera statistic:

$$JB = \frac{n}{6} S_u^2 + \frac{n}{24} (K_u - 3)^2 = 1,398496$$

Asymmetric coefficient (Skewness),

$$S_u = \frac{1}{n} \Sigma \left[\frac{u - \bar{u}}{\sigma_u} \right]^3 = 0,684394$$

in which $\sigma_u = \sqrt{\dfrac{\Sigma (u - \bar{u})^2}{n}}$, $\bar{u} = 0$

Bolt flattening coefficient (Kurtosis),

$$K_u = \frac{1}{n} \Sigma \left[\frac{u - \bar{u}}{\sigma_u} \right]^4 = 2,039058$$

In Figure 5 is exposed the standard error deviation of residual variable (Std.

Dev.), $\hat{\sigma}_u = \sqrt{\dfrac{\Sigma (u - \bar{u})^2}{n - 1}} = 153,2432$

To check the hypothesis of heteroskedasticity of the residual variable in the analysis of net profit growth by staff expenditure dynamics and dynamic of value adjustments on tangible and intangible assets we apply "test White". The test results are shown in Table 5.

Table 5.
Synoptic table of „White Heteroskedasticity Test"

White Heteroskedasticity Test:			
F-statistic	1,091042	Probability	0,450723
Obs*R-squared	5,714650	Probability	0,334982
Test Equation:			
Dependent Variable: RESID^2			
Method: Least Squares			
Sample: 2000 2011; Included observations: 12			
Dependent Variable: RESID^2 $= (y - \hat{y})^2 = u^2$;			
$u^2 = z = a + b \cdot SER\,02 + c \cdot SER\,02^2 + d \cdot SER\,02 \cdot SER\,03 + e \cdot SER\,03 + f \cdot SER\,03^2$			
$u^2 = z = a + b \cdot x_1 + c \cdot x_1^2 + d \cdot x_1 \cdot x_3 + e \cdot x_3 + f \cdot x_3^2$			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C „a"	-1,56E+08	88838164	-1,759883	0,1289
SER02 „b"	13600,21	7925,292	1,716051	0,1370

SER02^2	„c"	-0,294639	0,174605	-1,687458	0,1425
SER02*SER03	„d"	0,438571	0,275256	1,593319	0,1622
SER03	„e"	-10197,20	6409,089	-1,591053	0,1627
SER03^2	„f"	-0,160792	0,103544	-1,552885	0,1714
R-squared		0,476221	Mean dependent var		21526,53
Adjusted R-squared		0,039738	S.D. dependent var		22918,60
S.E. of regression		22458,62	Akaike info criterion		23,18359
Sum squared resid		3,03E+09	Schwarz criterion		23,42604
Log likelihood		-133,1015	F-statistic		1,091042
Durbin-Watson stat		2,563099	Prob (materiality) (F-statistically)		0,450723

Note: The indicators presented in synoptic picture of the results were obtained using the software Eviews.

Z variable is represented by square of residual value of econometric model.

As stated in synoptic table (Table 5), heteroskedasticity test is based on 2 criteria:

„F Criteria",

$$F - statistic < F - tabelar = F_{q=0,05\,;\,f_1=k-1=6-1=5\,;\,f_2=n-k=12-6=6} = 4,39$$

$$F - statistic = 1,091042 < F - tabelar = 4,39$$

$$F - statistic = \frac{\dfrac{\sum_i (\hat{z}_i - \bar{z})^2}{k-1}}{\dfrac{\sum_i (z_i - \hat{z}_i)^2}{n-k}} = 1,091042$$

„ χ^2 Criteria",

$$n \cdot R^2 < \chi^2 - tabelar = \chi^2_{q=0,05,\,f=k-1=6-1=5} \rightarrow 12 \cdot 0,476221 = 5,714652 < 11,1$$

The value of 2 inequalities, both reject the heteroskedasticity hypothesis of residual variable.

4. Conclusions – results interpretation

Econometric model of net profit growth by staff expenditure dynamics and dynamic of value adjustments on tangible and intangible assets is confirmed as a viable model for the following conditions:

- The ratio of correlation has a size very close to unity (0.99143) which confirms the existence of a strong correlation with the dynamics of net profit growth staff expenditures dynamic and value adjustments on tangible and intangible assets;

- If studied correlation, F - statistic = 259.0727 and found that the amount exceeds an important value in the table is 4.26 (*F*– table = 4,26).

In the table with Fisher values distribution, F - table, which corresponds to a probability of 95% and the number of degrees of freedom

$$f_1 = k - 1 = 3 - 1 = 2 \text{ and } f_2 = n - k = 12 - 3 = 9,$$

$$F - \text{statistic} = 259,0727 > F \text{ - table} = 4,26$$

$$F \text{ - table} = F_{P;\ f_1 = k - 1;\ f_2 = n - k} = F_{0,95\ ;\ f_1 = 3 - 1 = 2\ ;\ f_2 = 12 - 3 = 9} = 4,26$$

We can affirm, with reasonable confidence, that the ratio of the correlation is significantly different from zero or, in other words, the ratio of correlation validates the correlation between variables of studied system.

- Parameters b and c are significantly different from zero, the "t Criteria" with significance thresholds of 0.69% and 0.36% respectively. In these circumstances the independent variables (exogenous) x_1 and x_2 have a significant impact on net profit dynamic;

Note: If the estimates calculated for average errors of regression coefficients have high values compared to the size of these coefficients and low values for the variables that t-statistic that's t-tabulated below, for a significance level of 5%, according to the "t Criteria", null hypothesis is accepted and it is concluded that these regression coefficients statistical significance (their size is not significantly different from zero). The econometric model formalized through a regression equation is also in this case, the suspicion of being represented by the most significant exogenous variables, hence the requirement to produce other types of modeling by taking into account other variables, motivated of economic and considered viable.

- econometric model presents, by the size of regression coefficients b and c, that an increase in staff costs 100 RON there is a net profit increase of 62.1789 RON and 100 RON increase value adjustments of tangible and intangible assets, net profit increases by 60.6659 RON;

- Coefficient Durbin-Watson statistic (2.6> DW = 1.557420> 1.4) has a size that allows us to appreciate that variations of error term are not auto correlated, which is an additional condition to confirm the viability of the regression equation if used in the calculations of extrapolation. Conclusion nonexistent correlation between the values of the residual term is confirmed based on the Durbin-Watson distribution for a significance level q = 5% because 4 - 1.54> DW = 1.557420> 1.54 and also residues plot in Table 4, the alternative arrangement in relation to their origin, is a graphic form which supports the conclusion reached;

- The standard error of the estimation of the relative expression of the equation $\left(\hat{V}_{y.\hat{y}} = 0,76833\%\right)$ offers also a factor that maintains the viability of the model (the equation) because it has a sufficiently small size - less than 10%;

- Statistical significance similar to that which a relative standard error of the estimate of the regression equation is obtained by calculating and interpreting "the irregularity coefficient (inequality) of Theil" (Th = 0.3323%). Irregularity coefficient (inequality) of Theil can take a value between zero and one (100) and is considered to be a very good size to assess the viability of the model when Th does not exceed 5%.

- Based on the results presented in synoptic picture of the "White Heteroskedasticity Test," concludes that the residual variable is heteroskedastic (rejecting the hypothesis of heteroskedasticity) and hence the residual variable is homoskedastic and therefore the residual variable dispersion is constant. With the help of this test confirmed econometric model that formalizes the relationship of interdependence between the dynamics of net profit growth expenditures dynamic staff and value adjustments on tangible and intangible assets is appropriate viability, the stability.

One detail that does not support the viability of the econometric model and the effectiveness of the equation is the test for normality of the distribution of the residual variable (Fig. 5.) Because the probability of convergence to the normal distribution of the residual variable distribution, through the Jarque-Bera coefficient is less than the limit considered by 60% and is only 49.6959%, based on the law of partition χ^2, 2 degrees of freedom. This shortcoming may be removed if the number of observations would be higher. Getting a waste disposal results confirm a theoretical normal distribution assimilated form is meant to sustain the viability of representative indicators and econometric estimate of the dependent variable levels estimated levels foreseeable future.

The study attests utility of econometric analysis methodology to obtain information based rigorously as operational support for the

implementation of decisions with a clear direction for stimulating the human factor and to ensure effective effort and use of tangible and intangible fixed assets, the assets, technological equipment.

5. References

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