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The Life Satisfaction and the Quality of Life in Romania

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ABSTRACT

This article reflects a the statistical modeling of the values concerning the Life Satisfaction Index and the Quality of Life Index in Romania, through by means of the „Least Squares Method". The Life Satisfaction reflects the happiness in jobs, daily activities, social contacts, family, health and income. The Quality of Life reflects a good life which represents a life with a high quality.

1. Introduction

This paper reflects a statistical analysis of the trends regarding the Life Satisfaction Index, respectively the Quality of Life Index in Romania, between the years 2010-2014, respectively 2012-2015. The purpose of this research reflects the possibility for to anticipate the values concerning the evolutions in future of the Life Satisfaction Index, respectively the Quality of Life Index in Romania by means of the forecasting method. The statistical methods used are the „Coefficients of Variation Method", the „Least Squares Method" applied for to calculate the parameters of the regression equation and the Forecasting Method through the „Least Squares Method". The sections 2, respectively the section 3, present the methodology for to achieve the trends models for Life Satisfaction Index, respectively for the Quality of Life Index in Romania, with the help of the „Least Squares Method". The section 4 expresses the forecasting method reflected by the „Least Squares Method" applied for the Life Satisfaction Index, respectively the Quality of Life Index in Romania. The state of the art in this domain is represented by the research belongs to Carl Friederich Gauss, who created the „Least Squares Method" [1].

2. The modeling of the trend for the evolution regarding the Life Satisfaction Index in Romania, between 2010-2014

In Romania, in the period 2010-2014, we observe the next evolution concerning the Life Satisfaction Index, according to the table no. 1:

Table no. 1 The evolution of the Life Satisfaction Index in Romania, between 2010-2014

YEARS	THE LIFE SATISFACTION INDEX IN ROMANIA
2010	4,9
2011	5,0
2012	5,1
2013	5,2
2014	5,7

Source: „Human Development Report 2011-2015"

We want to identify the trend model for the values regarding the Life Satisfaction Index in Romania, in the period 2010-2014, using the table no. 1.

- if we formulate the null hypothesis H_0 *:* which mentions the assumption of the existence for the model of tendency of the factor *X = the Life Satisfaction Index, in Romania,* as being the function $x_{t_i} = a + b \cdot t_i$, then the parameters *a* and *b* of the adjusted linear function, can to be calculated by means of the next system [1]:

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$$S=\sum_{i=1}^{n}(x_i-x_{ti})^2=\min \Leftrightarrow S=\sum_{i=1}^{n}(x_i-a-bt_i)^2=\min$$

$$\begin{cases}\dfrac{\partial S}{\partial a}=0\\ \dfrac{\partial S}{\partial b}=0\end{cases}\Rightarrow\begin{cases}2\sum\limits_{1=1}^{n}(x_i-a-bt_i)(-1)=0/(-\dfrac{1}{2})\\ 2\sum\limits_{1=1}^{n}(x_i-a-bt_i)(-t_i)=0/(-\dfrac{1}{2})\end{cases}\Rightarrow\begin{cases}na+b\sum\limits_{i=1}^{n}t_i=\sum\limits_{i=1}^{n}x_i\\ a\sum\limits_{i=1}^{n}t_i+b\sum\limits_{i=1}^{n}t_i^2=\sum\limits_{i=1}^{n}x_it_i\end{cases}\Rightarrow$$

Therefore,

$$a=\frac{\begin{vmatrix}\sum\limits_{i=1}^{n}x_i & \sum\limits_{i=1}^{n}t_i\\ \sum\limits_{i=1}^{n}x_it_i & \sum\limits_{i=1}^{n}t_i^{\,2}\end{vmatrix}}{\begin{vmatrix}n & \sum\limits_{i=1}^{n}t_i\\ \sum\limits_{i=1}^{n}t_i & \sum\limits_{i=1}^{n}t_i^2\end{vmatrix}}=\frac{\sum\limits_{i=1}^{n}x_i\sum\limits_{i=1}^{n}t_i^2-\sum\limits_{i=1}^{n}x_it_i\sum\limits_{i=1}^{n}t_i}{n\sum\limits_{i=1}^{n}t_i^2-\left(\sum\limits_{i=1}^{n}t_i\right)^2}\quad b=\frac{\begin{vmatrix}n & \sum\limits_{i=1}^{n}x_i\\ \sum\limits_{i=1}^{n}t_i & \sum\limits_{i=1}^{n}x_it_i\end{vmatrix}}{\begin{vmatrix}n & \sum\limits_{i=1}^{n}t_i\\ \sum\limits_{i=1}^{n}t_i & \sum\limits_{i=1}^{n}t_i^{\,2}\end{vmatrix}}=\frac{n\sum\limits_{i=1}^{n}x_it_i-\sum\limits_{i=1}^{n}t_i\sum\limits_{i=1}^{n}x_i}{n\sum\limits_{i=1}^{n}t_i^{\,2}-\left(\sum\limits_{i=1}^{n}t_i\right)^2}$$

Table no. 2 The estimate of the value for the variation coefficient in the case of the adjusted linear function, in the hypothesis concerning the linear evolution of the Life Satisfaction Index, in Romania, between 2010-2014

YEARS	THE LIFE SATISFACTION INDEX IN ROMANIA (x_i)	*LINEAR TREND*				
		t_i	t_i^2	$t_i x_i$	$x_{t_i}=a+bt_i$	$\lvert x_i-x_{t_i}\rvert$
2010	**4,9**	-2	4	-9,8	4,82	0,08
2011	**5,0**	-1	1	-5,0	5,00	0
2012	**5,1**	0	0	0	5,18	0,08
2013	**5,2**	1	1	5,2	5,36	0,16
2014	**5,7**	2	4	11.4	5,54	0,16
TOTAL	**25,9**	0	10	1,8	25,9	0,48

If we calculate the statistical data for to adjust the linear function, we obtain for the parameters *a* and *b* the values:

$$a=\frac{25{,}9\cdot 10-1{,}8\cdot 0}{5\cdot 10-0^2}=5{,}18$$

$$b=\frac{5\cdot 1{,}8-0\cdot 25{,}9}{5\cdot 10-0^2}=0{,}18$$

Hence, the coefficient of variation for the adjusted linear function is:

$$v_I=\left[\frac{\sum\limits_{i=-m}^{m}\left|x_i-x_{t_i}^I\right|}{n}:\frac{\sum\limits_{i=-m}^{m}x_i}{n}\right]\cdot 100=\frac{\sum\limits_{i=-m}^{m}\left|x_i-x_{t_i}^I\right|}{\sum\limits_{i=-m}^{m}x_i}\cdot 100=\frac{0{,}48}{25{,}9}\cdot 100=1{,}85\%$$

- in the situation of the alternative hypothesis H_1 *:* which specifies the assumption of the existence for the model of tendency of the factor *X = the Life Satisfaction Index, in Romania*, as being the quadratic function

$x_{t_i} = a + b \cdot t_i + ct_i^2$, the parameters *a*, *b* şi *c* of the adjusted quadratic function, can to be calculated by means of the system [1]:

$$S = \sum_{i=1}^{n} (x_i - x_{ti})^2 = \min \Leftrightarrow S = \sum_{i=1}^{n} (x_i - a - bt_i - ct_i^2)^2 = \min$$

$$\begin{cases} \frac{\partial S}{\partial a} = 0 \\ \frac{\partial S}{\partial b} = 0 \Rightarrow \\ \frac{\partial S}{\partial c} = 0 \end{cases} \begin{cases} 2\sum_{1=1}^{n} (x_i - a - bt_i - ct_i^2)(-1) = 0 /(-\frac{1}{2}) \\ 2\sum_{1=1}^{n} (x_i - a - bt_i - ct_i^2)(-t_i) = 0 /(-\frac{1}{2}) \Rightarrow \\ 2\sum (x_i - a - bt_i - ct_i^2)(-t_i^2) = 0 /(-\frac{1}{2}) \end{cases}$$

Therefore,

$$\begin{cases} n \cdot a + b\sum_{i=1}^{n} t_i + c\sum_{i=1}^{n} t_i^2 = \sum_{i=1}^{n} x_i \\ a\sum_{i=1}^{n} t_i + b \cdot \sum_{i=1}^{n} t_i^2 + c\sum_{i=1}^{n} t_i^3 = \sum_{i=1}^{n} t_i \cdot x_i \\ a \cdot \sum_{i=1}^{n} t_i^2 + b\sum_{i=1}^{n} t_i^3 + c\sum_{i=1}^{n} t_i^4 = \sum_{i=1}^{n} t_i^2 \cdot x_i \end{cases}$$

$$a = \frac{\sum_{i=1}^{n} t_i^4 \sum_{i=1}^{n} x_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} t_i^2 \cdot x_i}{n\sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2\right)^2}$$

$$b = \frac{\sum_{i=1}^{n} x_i t_i}{\sum_{i=1}^{n} t_i^2}$$

$$c = \frac{n \cdot \sum_{i=1}^{n} t_i^2 \cdot x_i - \sum_{i=1}^{n} t_i^2 \cdot \sum_{i=1}^{n} x_i}{n\sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2\right)^2}$$

Table no. 3 The estimates of the value for the variation coefficient in the case of the adjusted quadratic function, in the hypothesis concerning the parabolic evolution of the Life Satisfaction Index, in Romania, between 2010-2014

YEARS	THE LIFE SATIS-FACTION INDEX IN ROMANIA (x_i)	*PARABOLIC TREND*						
		t_i	t_i^2	t_i^3	t_i^4	$t_i^2 x_i$	$x_{t_i} = a + bt_i + ct_i^2$	$\lvert x_i - x_{t_i} \rvert$
2010	**4,9**	-2	4	-8	16	19,6	4,934285714	0,03
2011	**5,0**	-1	1	-1	1	5	4,942857143	0,06
2012	**5,1**	0	0	0	0	0	5,065714286	0,03
2013	**5,2**	1	1	1	1	5,2	5,302857143	0,10
2014	**5,7**	2	4	8	16	22,8	5,654285714	0,05
TOTAL	**25,9**	0	10	0	34	52,6	25,9	0,27

If we calculate the statistical data for to adjust the quadratic function, we obtain for the parameters *a, b* and *c* the next values:

$$a=\frac{34\cdot 25{,}9-10\cdot 52{,}6}{5\cdot 34-10^2}=5{,}065714286$$

$$b=\frac{1{,}8}{10}=0{,}18$$

$$c=\frac{5\cdot 52{,}6-10\cdot 25{,}9}{5\cdot 34-10^2}=0{,}057142857$$

So, the coefficient of variation for the adjusted quadratic function has the value:

$$v_{II}=\left[\frac{\sum_{i=-m}^{m}\left|x_i-x_{t_i}^{II}\right|}{n}:\frac{\sum_{i=-m}^{m}x_i}{n}\right]\cdot 100=\frac{\sum_{i=-m}^{m}\left|x_i-x_{t_i}^{II}\right|}{\sum_{i=-m}^{m}x_i}\cdot 100=\frac{0{,}27}{25{,}9}\cdot 100=1{,}04\%$$

- in the case of the alternative hypothesis H_2 *:* which describes the supposition the assumption of the existence for the model of tendency of the factor *X = the Life Satisfaction Index, in Romania*, as being the exponential function $x_{t_i}=ab^{t_i}$, then the parameters *a* and *b* of the adjusted exponential function, can to be calculated by means of the next system [1]:

$$S=\sum_{i=1}^{n}(\lg x_i-\lg x_{t_i})^2=\min \Leftrightarrow S=\sum_{i=1}^{n}(\lg x_i-\lg a-t_i\lg b)^2=\min$$

$$\begin{cases}\dfrac{\partial S}{\partial \lg a}=0\\[2mm]\dfrac{\partial S}{\partial \lg b}=0\end{cases}\Rightarrow\begin{cases}2\sum_{1=1}^{n}(\lg x_i-\lg a-t_i\lg b)(-1)=0\,/(-\frac{1}{2})\\[2mm]2\sum_{1=1}^{n}(\lg x_i-\lg a-t_i\lg b)(-t_i)=0\,/(-\frac{1}{2})\end{cases}\Rightarrow$$

$$\begin{cases}n\cdot\lg a+\lg b\cdot\sum_{i=1}^{n}t_i=\sum_{i=1}^{n}\lg x_i\\[2mm]\lg a\sum_{i=1}^{n}t_i+\lg b\cdot\sum_{i=1}^{n}t_i^2=\sum_{i=1}^{n}t_i\cdot\lg x_i\end{cases}$$

Thus,

$$\lg a=\frac{\begin{vmatrix}\sum_{i=1}^{n}\lg x_i & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i\lg x_i & \sum_{i=1}^{n}t_i{}^2\end{vmatrix}}{\begin{vmatrix}n & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i^2\end{vmatrix}}=\frac{\sum_{i=1}^{n}\lg x_i\sum_{i=1}^{n}t_i{}^2-\sum_{i=1}^{n}t_i\lg x_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i{}^2-\left(\sum_{i=1}^{n}t_i\right)^2}$$

and $$\lg b = \frac{\begin{vmatrix} n & \sum_{i=1}^{n} \lg x_i \\ \sum_{i=1}^{n} t_i & \sum_{i=1}^{n} t_i \lg x_i \end{vmatrix}}{\begin{vmatrix} n & \sum_{i=1}^{n} t_i \\ \sum_{i=1}^{n} t_i & \sum_{i=1}^{n} t_i^2 \end{vmatrix}} = \frac{n \cdot \sum_{i=1}^{n} t_i \lg x_i - \sum_{i=1}^{n} \lg x_i \sum_{i=1}^{n} t_i}{n \sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i \right)^2}$$

Table no. 4 The estimate of the value for the variation coefficient in the case of the adjusted exponential function, in the hypothesis concerning the exponential evolution of the Life Satisfaction Index in Romania, between 2010-2014

YEARS	THE LIFE SATIS-FACTION INDEX IN ROMANIA (x_i)	*EXPONENTIAL TREND*					
		t_i	$\lg x_i$	$t_i \lg x_i$	$\lg x_{ti} = \lg a + t_i \lg b$	$x_{ti} = ab^{t_i}$	$\lvert x_i - x_{t_i} \rvert$
2010	**4,9**	-2	0,690196080	-1,380392160	0,684044713	4,831085382	0,07
2011	**5,0**	-1	0,698970004	-0,698970004	0,698883802	4,999007657	0
2012	**5,1**	0	0,707570176	0	0,713722891	5,172766694	0,07
2013	**5,2**	1	0,716003343	0,716003343	0,72856198	5,352565370	0,15
2014	**5,7**	1	0,755874855	1,511749711	0,743401069	5,538613616	0,16
TOTAL	**25,9**		3,568614459	0,14839089			0,45

Consequently, if we calculate the statistical data for to adjust the exponential function, we obtain for the parameters *a* and *b* the values:

$$\lg a = \frac{3{,}568614459}{5} = 0{,}713722891$$

$$\lg b = \frac{0{,}14839089}{10} = 0{,}014839089$$

Accordingly, the coefficient of variation for the adjusted exponential function has the next value:

$$v_{\exp} = \left[\frac{\sum_{i=-m}^{m} \left| x_i - x_{t_i}^{\exp} \right|}{n} : \frac{\sum_{i=-m}^{m} x_i}{n} \right] \cdot 100 = \frac{\sum_{i=-m}^{m} \left| x_i - x_{t_i}^{\exp} \right|}{\sum_{i=-m}^{m} x_i} \cdot 100 = \frac{0{,}45}{25{,}9} \cdot 100 = 1{,}74\%$$

We apply the coefficients of variation method as criterion of selection for the best model of trend.
We notice that:

$$v_{II} = 1{,}04\% < v_{\exp} = 1{,}74\% < v_I = 1{,}85\%$$

So, **the path reflected by X factor, which represents the Life Satisfaction Index, in Romania, between 2010-2014, is a parabolical trend** of the shape $x_{t_i} = a + b \cdot t_i + ct_i^2$, with other words it confirms the hypothesis H_1 .

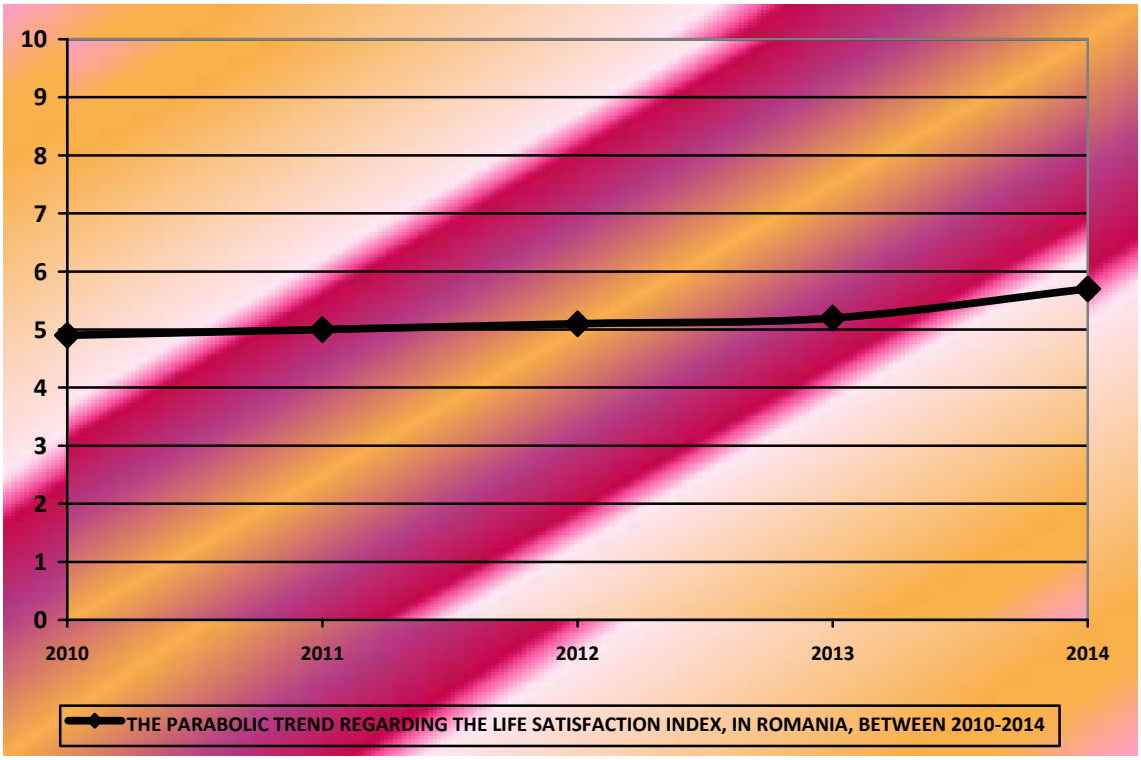


Figure 1. The trend model of the values for the Life Satisfaction Index, in Romania, between 2010-2014

We observe that, the cloud of points which reflects the values concerning the Life Satisfaction Index, in Romania, between 2010-2014, it carrying around a parabolical trend model, according to the type no.1.

3. The modeling of the trend for the evolution regarding the Quality of Life Index in Romania, between 2012-2015

In Romania, in the period 2012-2015, we observe in the table no. 5 the next evolution concerning the Quality of Life Index in Romania:

Table no. 5 The evolution of the Quality of Life Index in Romania, between 2012-2015

YEARS	THE QUALITY OF LIFE INDEX IN ROMANIA
2012	25,52
2013	57,75
2014	63,27
2015	83,63

Source: „Human Development Report 2011-2015"

We want to identify the trend model for the Quality of Life Index, in Romania, in the period 2012-2015, using the table no. 5.

- if we formulate the null hypothesis H_0 *:* which mentions the assumption of the existence for the model of tendency of the factor *Y = the Quality of Life Index in Romania,* as being the function $y_{t_i} = a + b \cdot t_i$, then the parameters *a* and *b* of the adjusted linear function, can to be calculated by means of the next system [1]:

$$S = \sum_{i=1}^{n} (y_i - y_{ti})^2 = \min \Leftrightarrow S = \sum_{i=1}^{n} (y_i - a - bt_i)^2 = \min$$

$$\begin{cases}\dfrac{\partial S}{\partial a}=0\\ \dfrac{\partial S}{\partial b}=0\end{cases}\Rightarrow\begin{cases}2\sum_{1=1}^{n}(y_i-a-bt_i)(-1)=0/(-\dfrac{1}{2})\\ 2\sum_{1=1}^{n}(y_i-a-bt_i)(-t_i)=0/(-\dfrac{1}{2})\end{cases}\Rightarrow\quad\begin{cases}na+b\sum_{i=1}^{n}t_i=\sum_{i=1}^{n}y_i\\ a\sum_{i=1}^{n}t_i+b\sum_{i=1}^{n}t_i^2=\sum_{i=1}^{n}y_it_i\end{cases}\Rightarrow$$

Therefore,

$$a=\frac{\begin{vmatrix}\sum_{i=1}^{n}y_i & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}y_it_i & \sum_{i=1}^{n}t_i^{\,2}\end{vmatrix}}{\begin{vmatrix}n & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i^{\,2}\end{vmatrix}}=\frac{\sum_{i=1}^{n}y_i\sum_{i=1}^{n}t_i^{\,2}-\sum_{i=1}^{n}y_it_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^{\,2}-\left(\sum_{i=1}^{n}t_i\right)^2}\quad b=\frac{\begin{vmatrix}n & \sum_{i=1}^{n}y_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}y_it_i\end{vmatrix}}{\begin{vmatrix}n & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i^{\,2}\end{vmatrix}}=\frac{n\sum_{i=1}^{n}y_it_i-\sum_{i=1}^{n}t_i\sum_{i=1}^{n}y_i}{n\sum_{i=1}^{n}t_i^{\,2}-\left(\sum_{i=1}^{n}t_i\right)^2}$$

Table no. 6 The estimate of the value for the variation coefficient in the case of the adjusted linear function, in the hypothesis concerning the linear evolution of the Quality of Life Index, in Romania, between 2012-2015

YEARS	THE QUALITY OF LIFE INDEX IN ROMANIA (y_i)	*LINEAR TREND*				
		t_i	t_i^2	$t_i y_i$	$y_{t_i}=a+bt_i$	$\lvert y_i-y_{t_i}\rvert$
2012	**25,52**	-2	4	-51,04	33,1945	7,67
2013	**57,75**	-1	1	-57,75	45,3685	12,38
2014	**63,27**	1	1	63,27	69,7165	6,45
2015	**83,63**	2	4	167,26	81,8905	1,74
TOTAL	**230,17**	0	10	121,74	230,17	28,24

If we calculate the statistical data for to adjust the linear function, we obtain for the parameters *a* and *b* the values:

$$a=\frac{230\cdot 10-121{,}74\cdot 0}{4\cdot 10-0^2}=57{,}5425$$

$$b=\frac{4\cdot 121{,}74-0\cdot 230{,}17}{4\cdot 10-0^2}=12{,}174$$

Hence, the coefficient of variation for the adjusted linear function is:

$$v_I=\left[\frac{\sum_{i=-m}^{m}\lvert y_i-y_{t_i}^I\rvert}{n}:\frac{\sum_{i=-m}^{m}y_i}{n}\right]\cdot 100=\frac{\sum_{i=-m}^{m}\lvert y_i-y_{t_i}^I\rvert}{\sum_{i=-m}^{m}y_i}\cdot 100=\frac{28{,}24}{230{,}17}\cdot 100=12{,}26919234\%$$

- in the situation of the alternative hypothesis H_1 *:* which specifies the assumption of the existence for the model of tendency of the factor *Y = the Quality of Life Index in Romania*, as being the quadratic function $y_{t_i}=a+b\cdot t_i+ct_i^2$, the parameters *a*, *b* şi *c* of the adjusted quadratic function, can to be calculated by means of the system [1]:

$$S=\sum_{i=1}^{n}(y_i-y_{ti})^2=\min \Leftrightarrow S=\sum_{i=1}^{n}(y_i-a-bt_i-ct_i^2)^2=\min$$

$$\begin{cases}\frac{\partial S}{\partial a}=0\\ \frac{\partial S}{\partial b}=0\\ \frac{\partial S}{\partial c}=0\end{cases}\Rightarrow\begin{cases}2\sum_{1=1}^{n}(y_i-a-bt_i-ct_i^2)(-1)=0/(-\frac{1}{2})\\ 2\sum_{1=1}^{n}(y_i-a-bt_i-ct_i^2)(-t_i)=0/(-\frac{1}{2})\\ 2\sum(y_i-a-bt_i-ct_i^2)(-t_i^2)=0/(-\frac{1}{2})\end{cases}\Rightarrow$$

Therefore,

$$\begin{cases}n\cdot a+b\sum_{i=1}^{n}t_i+c\sum_{i=1}^{n}t_i^2=\sum_{i=1}^{n}y_i\\ a\sum_{i=1}^{n}t_i+b\cdot\sum_{i=1}^{n}t_i^2+c\sum_{i=1}^{n}t_i^3=\sum_{i=1}^{n}t_i\cdot y_i\\ a\cdot\sum_{i=1}^{n}t_i^2+b\sum_{i=1}^{n}t_i^3+c\sum_{i=1}^{n}t_i^4=\sum_{i=1}^{n}t_i^2\cdot y_i\end{cases}$$

$$a=\frac{\sum_{i=1}^{n}t_i^4\sum_{i=1}^{n}y_i-\sum_{i=1}^{n}t_i^2\sum_{i=1}^{n}t_i^2\cdot y_i}{n\sum_{i=1}^{n}t_i^4-\left(\sum_{i=1}^{n}t_i^2\right)^2}$$

$$b=\frac{\sum_{i=1}^{n}y_it_i}{\sum_{i=1}^{n}t_i^2}$$

$$c=\frac{n\cdot\sum_{i=1}^{n}t_i^2\cdot y_i-\sum_{i=1}^{n}t_i^2\cdot\sum_{i=1}^{n}y_i}{n\sum_{i=1}^{n}t_i^4-\left(\sum_{i=1}^{n}t_i^2\right)^2}$$

Table no. 7 The estimates of the value for the variation coefficient in the case of the adjusted quadratic function, in the hypothesis concerning the parabolic evolution of the Quality of Life Index in Romania, between 2012-2015

YEARS	**THE QUALITY OF LIFE INDEX IN ROMANIA (y_i)**	*A.* *PARABOLIC TREND* ***B.***					
		t_i	t_i^2	t_i^4	$t_i^2 y_i$	$y_{t_i}=a+bt_i+ct_i^2$	$\lvert y_i-y_{t_i}\rvert$
2012	**25,52**	-2	4	16	102,08	30,227	4,707
2013	**57,75**	-1	1	1	57,75	48,336	9,414
2014	**63,27**	1	1	1	63,27	72,684	9,414
2015	**83,63**	2	4	16	334,52	78,923	4,707
TOTAL	**230,17**	0	10	34	557,62	230,17	28,242

If we calculate the statistical data for to adjust the quadratic function, we obtain for the parameters *a, b* and *c* the next values:

$$a=\frac{34\cdot 230{,}17-10\cdot 557{,}626}{4\cdot 34-10^2}=62{,}48833333$$

$$b=\frac{121,74}{10}=12,174$$
$$c=\frac{4\cdot 557,62-10\cdot 230,17}{4\cdot 34-10^2}=-1,978333333$$

So, the coefficient of variation for the adjusted quadratic function has the value:

$$v_{II}=\left[\frac{\sum_{i=-m}^{m}\left|y_i-y_{t_i}^{II}\right|}{n}:\frac{\sum_{i=-m}^{m}y_i}{n}\right]\cdot 100=\frac{\sum_{i=-m}^{m}\left|y_i-y_{t_i}^{II}\right|}{\sum_{i=-m}^{m}y_i}\cdot 100=\frac{28,242}{230,17}\cdot 100=12,27006126\%$$

- in the case of the alternative hypothesis H_2 *:* which describes the supposition the assumption of the existence for the model of tendency of the factor *Y = the Quality of Life Index in Romania*, as being the exponential function $y_{t_i}=ab^{t_i}$, then the parameters *a* and *b* of the adjusted exponential function, can to be calculated by means of the next system [1]:

$$S=\sum_{i=1}^{n}(\lg y_i-\lg y_{t_i})^2=\min \Leftrightarrow S=\sum_{i=1}^{n}(\lg y_i-\lg a-t_i\lg b)^2=\min$$

$$\begin{cases}\dfrac{\partial S}{\partial \lg a}=0\\ \dfrac{\partial S}{\partial \lg b}=0\end{cases}\Rightarrow\begin{cases}2\sum_{1=1}^{n}(\lg y_i-\lg a-t_i\lg b)(-1)=0/(-\frac{1}{2})\\ 2\sum_{1=1}^{n}(\lg y_i-\lg a-t_i\lg b)(-t_i)=0/(-\frac{1}{2})\end{cases}\Rightarrow$$

$$\begin{cases}n\cdot\lg a+\lg b\cdot\sum_{i=1}^{n}t_i=\sum_{i=1}^{n}\lg y_i\\ \lg a\sum_{i=1}^{n}t_i+\lg b\cdot\sum_{i=1}^{n}t_i^2=\sum_{i=1}^{n}t_i\cdot\lg y_i\end{cases}$$

Thus,
$$\lg a=\frac{\begin{vmatrix}\sum_{i=1}^{n}\lg y_i & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i\lg y_i & \sum_{i=1}^{n}t_i{}^2\end{vmatrix}}{\begin{vmatrix}n & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i^2\end{vmatrix}}=\frac{\sum_{i=1}^{n}\lg y_i\sum_{i=1}^{n}t_i^2-\sum_{i=1}^{n}t_i\lg y_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^2-\left(\sum_{i=1}^{n}t_i\right)^2}$$

and
$$\lg b=\frac{\begin{vmatrix}n & \sum_{i=1}^{n}\lg y_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i\lg y_i\end{vmatrix}}{\begin{vmatrix}n & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i^2\end{vmatrix}}=\frac{n\cdot\sum_{i=1}^{n}t_i\lg y_i-\sum_{i=1}^{n}\lg y_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^2-\left(\sum_{i=1}^{n}t_i\right)^2}$$

Table no. 8 The estimate of the value for the variation coefficient in the case of the adjusted exponential function, in the hypothesis concerning the exponential evolution of the Quality of Life Index in Romania, between 2012-2015

YEARS	THE QUALITY OF LIFE INDEX IN ROMANIA (y_i)	EXPONENTIAL TREND					
		t_i	$\lg y_i$	$t_i \lg y_i$	$\lg y_{ti} = \lg a + t_i \lg b$	$y_{ti} = ab^{t_i}$	$\lvert y_i - y_{t_i} \rvert$
2012	**25,52**	-2	1,406880670	-2,813761340	1,508876410	32,27575499	6,76
2013	**57,75**	-1	1,761551989	-1,761551989	1,615937279	41,29878538	16,45
2014	**63,27**	1	1,801197834	1,801197834	1,830059017	67,61748557	4,35
2015	**83,63**	2	1,922362097	3,844724194	1,937119886	86,52067242	2,89
TOTAL	**230,17**	0	6.891992590	1,070608699			30,45

Consequently, if we calculate the statistical data for to adjust the exponential function, we obtain for the parameters *a* and *b* the values:

$$\lg a = \frac{6{,}89199259}{4} = 1{,}722998148$$

$$\lg b = \frac{1{,}070608699}{10} = 0{,}107060869$$

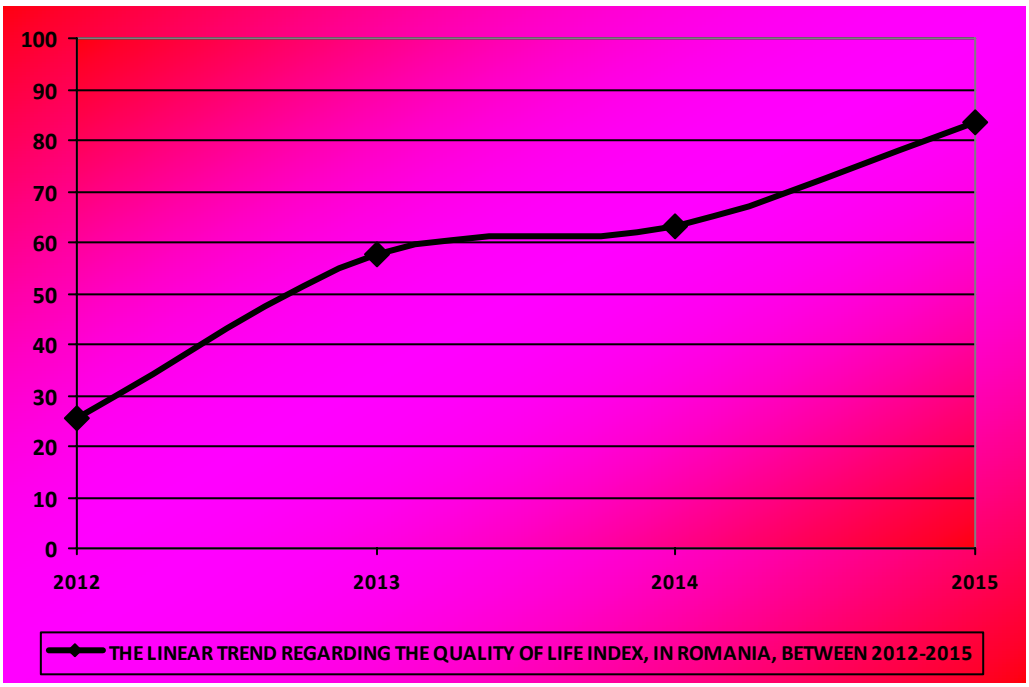
Accordingly, the coefficient of variation for the adjusted exponential function has the next value:

$$v_{\exp} = \left[\frac{\sum_{i=-m}^{m} \left| y_i - y_{t_i}^{\exp} \right|}{n} : \frac{\sum_{i=-m}^{m} y_i}{n} \right] \cdot 100 = \frac{\sum_{i=-m}^{m} \left| y_i - y_{t_i}^{\exp} \right|}{\sum_{i=-m}^{m} y_i} \cdot 100 = \frac{30{,}45}{230{,}17} \cdot 100 = 13{,}23\%$$

We apply the coefficients of variation method as criterion of selection for the best model of trend.
We notice that:

$$v_I = 12{,}26919234\% < v_{II} = 12{,}27006126\% < v_{\exp} = 13{,}23\%$$

So, the path reflected by Y factor, which represents the Quality of Life Index in Romania, between 2012-2015, is a linear trend of the shape $y_{t_i} = a + b \cdot t_i$, with other words it confirms the hypothesis H_0.



The type no. 2 The trend model of the values for the Quality of Life Index, in Romania, between 2012-2015

We observe that, the cloud of points which reflects the values regarding the Quality of Life Index, in Romania, between 2012-2015, it carrying around an linear trend model, according to the type no. 2.

4. The forecasting method through the „Least Squares Method"

We know that the evolution of the Life Satisfaction Index in Romania, between 2010-2014, reflects a parabolic trend of the shape $x_{t_i} = a + b \cdot t_i + ct_i^2$.

So, in 2016 and 2017, the Life satisfaction Index in Romania will be:

$$Life\_satisfaction\_Index_{2016}^{Romania} = 5{,}065714286 + 0{,}18 \cdot 4 + 0{,}057142857 \cdot 4^2 = 6{,}70$$
$$Life\_satisfaction\_Index_{2017}^{Romania} = 5{,}065714286 + 0{,}18 \cdot 5 + 0{,}057142857 \cdot 5^2 = 7{,}39$$

Also, the trend of the values regarding the Quality of Life Index in Romania, between 2012-2015, is a linear trend of the shape $y_{t_i} = a + b \cdot t_i$.

Thus, in 2016 and 2017, the Quality of Life Index in Romania will be:

$$Quality\_of\_Life\_Index_{2016}^{Romania} = 57{,}5425 + 12{,}174 \cdot 3 = 94{,}0645$$
$$Quality\_of\_Life\_Index_{2017}^{Romania} = 57{,}5425 + 12{,}174 \cdot 4 = 106{,}2385$$

4. Conclusions

We can to synthesize that in future, the evolutions regarding the Life Satisfaction Index, respectively the Quality of Life Index are in growing in Romania in 2016 and 2017. In the architecture of the Life Satisfaction Index, the social contacts and the family have the highest impact on the Life Satisfaction Index, followed by jobs and daily activities, health, respectively income [2]. The Quality of Life Index incorporates a spectrum where in him composition we find the well-being, the satisfaction with the life, the happiness and the meaning in life [5].

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