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18th edition of the Conference "Risk in Contemporary Economy", RCE2017, June 9-10, 2017, Galati, Romania

Risk in Contemporary Economy

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https://doi.org/10.18662/lumproc.rce2017.1.2

How to cite: Opaiţ, G. (2017). The Statistical Connector between the Health Expenditures and the Life Expectancy, in United States. In S. Hugues, & N. Cristache (eds.), *Risk in Contemporary Economy* (pp. 9-29). Iasi, Romania: LUMEN Proceedings. https://doi.org/10.18662/lumproc.rce2017.1.2

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International Scientific Conference Risk in Contemporary Economy | RCE 2017 | 9-10 June 2017 | Galati – Romania

The Statistical Connector between the Health Expenditures and the Life Expectancy, in United States

Gabriela OPAIȚ[1*]

Abstract

The efficacy politic of the federal government in United States, concerning the Health Care System and the Health Expenditures, develops a „fingerprint" in the optimization of the values regarding the Life Expectancy. The aim of this research is to emphasize the powerful and the precious statistical connection between the Health Expenditures and the Life Expectancy in United States. The Health Expenditures represents the "sparks of the internal combustion engines" which put in movement the circuits of the "energetic high tides" from hospitals and medical clinics, for to maintain or to obtain the health of the patients. In any country, the Health Expenditures constitute important "energetic source" for to achieve a high Life Expectancy. In this research, the United States represent a model which musts be applied on international level by all the countries. In each year, the United States have "astronomical numbers" reflected by the Health Expenditures and this statistical analysis through the correlation coefficient demonstrates that, there is a very important and beneficial influence of the Health Expenditures on Life Expectancy in the United States, which have "astronomical numbers" presented by the Life Expectancy. Everywhere on globe, a high quota destined to the Health Expenditures has as effect a good health for nation and this effect, as in a "perpetuum mobile", achieves a well-being and an economic development for the respective country. The Life Expectancy and the Health Expenditures must to represent for any country "targets" of the good health and well-being for these nations.

Keywords: *Health Expenditures, Connector, Correlation Coefficient, Spectral Analysis.*

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https://doi.org/10.18662/lumproc.rce2017.1.2
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Selection and peer-review under responsibility of the Organizing Committee of the conference

1. Introduction

In United States, the strong dynamics of the Health Expenditure achieves a maximum effect on Life Expectancy which expresses an exponential rise, because the effectiveness of the american leadership, in the „art management" concerning the Health Expenditures, presents deep roots in the high culture of the „American School of Management" and this efficacy of the Health Expenditures is interweaved with the american mentality on prolongation of the healthy life with the target in the U.S.A. Health Index, which occupies the fifth place at the top of the international Health Index classification.

In this study we can to „relish" the reflections of the models for the functions which express the important relationship between the Health Expenditures and the Life Expectancy in U.S.A., respectively which reveal the evolution of the Health Expenditures in United States and the dynamics of the Life Expectancy in U.S.A.

Also, we can to observe the interpretation of the interrelationship between the Health Expenditures and the Life Expectancy in U.S.A., the forecasts of the Health Expenditures and the foresights of the Life Expectancy in United States, in the same interval 2018-2030.

2. Problem Statement

The discovery of the „Little Squares Method" in 1823, by Carl Friedrich Gauss, represented the „drop of essence" which created the start point of this statistical research about the powerful connection between the Health Expenditures and the Life Expectancy in United States.

This article represents the first international statistical analysis which models the important statistical connection between the Health Expenditures and the Life Expectancy in the United States.

3. Aims of the research

The aim of this research focuses the way through which we can to identify statistical model which expresses the relationship between the Health Expenditures in United States and the Life Expectancy in United States in the time interval 2000-2015.

4. Research Methods

This research „interweaves” the Variation Coefficients Method with the Correlation Coefficients Method for to reflect the trend model and the intensity regarding the connection between the Health Expenditures and the Life Expectancy in the United States. The Variation Coefficients Method puts in evidence the trend model of the analysed phenomenon, in our case the connection between the Health Expenditures and the Life Expectancy in the United States, through the little value of the variation coefficient which is in accordance with the function supposed in the hypothesis. The Correlation Coefficients Method expresses the intensity of the connection between two variables analysed, the Health Expenditures in the United States and the Life Expectancy in the United States. The Correlation Coefficient has the values in [-1; +1] interval, if the value of the Correlation Coefficient tends to the values -1 or +1, then there is a strong intensity of the correlation between the two variables researched in our project of statistical analysis.

5. Findings

5.1. The algorithm regarding the achievement of the architecture for the function which reflects the correlation between the Health Expenditures and the Life Expectancy in United States, in the period 2000-2015

Table 1. The evolution of the values concerning the Health Expenditures and the Life Expectancy in United States of America

YEARS	HEALTH EXPENDITURES UNITED STATES (%) G.D.P. (ξ_i)	LIFE EXPECTANCY UNITED STATES (YEARS) (ω_i)
2000	13,1	76,8
2001	13,7	77,0
2002	14,5	77,0
2003	15,1	77,2
2004	15,1	77,6
2005	15,2	77,6
2006	15,3	77,8
2007	15,6	78,1
2008	16,0	78,2
2009	17,0	78,5
2010	17,0	78,7
2011	17,1	78,7
2012	17,0	78,8
2013	16,9	78,8
2014	17,1	78,8
2015	17,8	79,3

The source: „World Bank” 2017 New York; „Human Development Report 2016”, New York, United States

- when the function $\omega_{t_i} = a + b \cdot \xi_i$ reflects a viable model for the existence of the correlation between ξ = the Health Expenditures in United States and ω = the Life Expectancy in United States, *a* and *b* will be [4]:

Table 2. The linear correlation between the Health Expenditures in United States and the Life Expectancy in United States, for the time interval 2000-2015

YEARS	HEALTH EXPENDITURES (%) G.D.P. U.S.A. (ξ_i)	LIFE EXPECTANCY U.S.A. (ω_i)	LINEAR TREND			
			ξ_i^2	$\xi_i\ \omega_i$	$\omega_{\xi_i} = a + b\xi_i$	$\lvert\omega_i - \omega_{\xi_i}\rvert$
2000	**13,1**	**76,8**	171,61	1006,08	76,52126478	0,3
2001	**13,7**	**77,0**	187,69	1054,90	76,85693353	0,1
2002	**14,5**	**77,0**	210,25	1111,50	77,30449186	0,3
2003	**15,1**	**77,2**	228,01	1165,72	77,64016061	0,4
2004	**15,1**	**77,6**	228,01	1171,76	77,64016061	0
2005	**15,2**	**77,6**	231,04	1179,52	77,69610540	0,1
2006	**15,3**	**77,8**	234,09	1190,34	77,75205019	0,1
2007	**15,6**	**78,1**	243,36	1218,36	77,91988456	0,2
2008	**16,0**	**78,2**	256,00	1251,20	78,14366373	0,1
2009	**17,0**	**78,5**	289,00	1334,50	78,70311164	0,2
2010	**17,0**	**78,7**	289,00	1337,90	78,70311164	0
2011	**17,1**	**78,7**	292,41	1345,77	78,75905643	0,1
2012	**17,0**	**78,8**	289,00	1339,60	78,70311164	0,1
2013	**16,9**	**78,8**	285,61	1331,72	78,64716685	0,2
2014	**17,1**	**78,8**	292,41	1347,48	78,75905643	0
2015	**17,8**	**79,3**	316,84	1411,54	79,15066997	0,2
TOTAL	**253,5**	**1248,9**	4044,33	19802,89	**1248,9**	2,4

$$\begin{cases} n \cdot a + b\sum_{i=1}^{n}\xi_i = \sum_{i=1}^{n}\omega_i \\ a\sum_{i=1}^{n}\xi_i + b \cdot \sum_{i=1}^{n}\xi_i^2 = \sum_{i=1}^{n}\xi_i \cdot \omega_i \end{cases}$$

$$a = \frac{\sum_{i=1}^{n}\xi_i^2\sum_{i=1}^{n}\omega_i - \sum_{i=1}^{n}\xi_i\sum_{i=1}^{n}\xi_i\omega_i}{n\sum_{i=1}^{n}\xi_i^2 - (\sum_{i=1}^{n}\xi_i)^2};\quad b = \frac{n\sum_{i=1}^{n}\xi_i\ \omega_i - \sum_{i=1}^{n}\xi_i\sum_{i=1}^{n}\omega_i}{n\sum_{i=1}^{n}\xi_i^2 - (\sum_{i=1}^{n}\xi_i)^2}$$

$$a = \frac{\sum_{i=1}^{n}\xi_i^2\sum_{i=1}^{n}\omega_i - \sum_{i=1}^{n}\xi_i\sum_{i=1}^{n}\xi_i\omega_i}{n\sum_{i=1}^{n}\xi_i^2 - (\sum_{i=1}^{n}\xi_i)^2} = \frac{4044,33 \cdot 1248,9 - 19802,89 \cdot 253,5}{16 \cdot 4044,33 - (253,5)^2} = 69,19249715$$

$$b = \frac{n\sum_{i=1}^{n}\xi_i\ \omega_i - \sum_{i=1}^{n}\xi_i\sum_{i=1}^{n}\omega_i}{n\sum_{i=1}^{n}\xi_i^2 - (\sum_{i=1}^{n}\xi_i)^2} = \frac{16 \cdot 19802,89 - 253,5 \cdot 1248,9}{16 \cdot 4044,33 - (253,5)^2} = 0,559447911$$

$$v_I = \left[\frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{\xi_i}^I \right|}{n} : \frac{\sum_{i=1}^{n} \omega_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{\xi_i}^I \right|}{\sum_{i=1}^{n} \omega_i} \cdot 100 = \frac{2{,}4}{1248{,}9} \cdot 100 = 0{,}19\%$$

- when the function $\omega_{\xi_i} = a + b \cdot \xi_i + c\xi_i^2$ makes visible the existence of the correlation between ξ = the Health Expenditures in Unites States and ω = the Life Expectancy in United States, *a, b* and *c* will be [4]:

Table 3. The parabolic correlation between the Health Expenditures in United States and the Life Expectancy in United States, for the time interval 2000-2015

YEARS	HEALTH EXPENDITURES (%) G.D.P. U.S.A. (ξ_i)	LIFE EXPECTANCY U.S.A. (ω_i)	PARABOLIC TREND				
			ξ_i^3	ξ_i^4	$\xi_i^2\omega_i$	$\omega_{\xi_i} = a + b\xi_i + c\xi_i^2$	$\lvert\omega_i - \omega_{\xi_i}\rvert$
2000	**13,1**	**76,8**	2248,091	29449,9210	13179,648	76,73044973	0,1
2001	**13,7**	**77,0**	2571,353	35227,5361	14452,130	76,93567159	0,1
2002	**14,5**	**77,0**	3048,625	44205,0625	16189,250	77,26617164	0,3
2003	**15,1**	**77,2**	3442,951	51988,5601	17602,372	77,55669985	0,4
2004	**15,1**	**77,6**	3442,951	51988,5601	17693,576	77,55669985	0,4
2005	**15,2**	**77,6**	3511,808	53379,4816	17928,704	77,60867565	0
2006	**15,3**	**77,8**	3581,577	54798,1281	18212,202	77,66166701	0,1
2007	**15,6**	**78,1**	3796,416	59224,0896	19006,416	77,82673438	0,3
2008	**16,0**	**78,2**	4096,000	65536,0000	20019,200	78,06104192	0,1
2009	**17,0**	**78,5**	4913,000	83521,0000	22686,500	78,71789942	0,2
2010	**17,0**	**78,7**	4913,000	83521,0000	22744,300	78,71789942	0,2
2011	**17,1**	**78,7**	5000,211	85503,6081	23012,667	78,78917070	0,1
2012	**17,0**	**78,8**	4913,000	83521,0000	22773,200	78,71789942	0,1
2013	**16,9**	**78,8**	4826,809	81573,0721	22506,068	78,64764369	0,2
2014	**17,1**	**78,8**	5000,211	85503,6081	23041,908	78,78917070	0
2015	**17,8**	**79,3**	5939,752	00387,5856	25125,412	79,31650514	0
TOTAL	**253,5**	**1248,9**	64945,755	1049328,284	316173,553	**1248,9**	2,6

$$S=\sum_{i=1}^{n}(\omega_i-\omega_{\xi i})^2=\min \Leftrightarrow S=\sum_{i=1}^{n}(\omega_i-a-b\xi_i-c\xi_i^2)^2=\min$$

$$\begin{cases}\dfrac{\partial S}{\partial a}=0\\ \dfrac{\partial S}{\partial b}=0\Rightarrow\\ \dfrac{\partial S}{\partial c}=0\end{cases}\begin{cases}2\sum_{1=1}^{n}(\omega_i-a-b\xi_i-c\xi_i^2)(-1)=0/(-\frac{1}{2})\\ 2\sum_{1=1}^{n}(\omega_i-a-b\xi_i-c\xi_i^2)(-\xi_i)=0/(-\frac{1}{2})\Rightarrow\\ 2\sum(\omega_i-a-b\xi_i-c\xi_i^2)(-\xi_i^2)=0/(-\frac{1}{2})\end{cases}$$

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

$$\begin{cases}16\cdot a+253{,}5\cdot b+4044{,}33\cdot c=1248{,}9\\ 253{,}5\cdot a+4044{,}33\cdot b+64945{,}755\cdot c=19802{,}89\\ 4044{,}33\cdot a+64945{,}755\cdot b+1049328{,}284\cdot c=316173{,}553\end{cases}\Rightarrow$$

$$a=81{,}36282672\ ;\quad b=-1{,}018803006\quad ;\quad c=0{,}050777591$$

$$v_{II}=\left[\frac{\sum_{i=1}^{n}\left|\omega_i-\omega_{\xi_i}^{II}\right|}{n}:\frac{\sum_{i=1}^{n}\omega_i}{n}\right]\cdot 100=\frac{\sum_{i=1}^{n}\left|\omega_i-\omega_{\xi_i}^{II}\right|}{\sum_{i=1}^{n}\omega_i}\cdot 100=\frac{2{,}6}{1248{,}9}\cdot 100=0{,}21\%$$

- when the function $\omega_{\xi_i}=ab^{\xi_i}$ expresses the existence of the correlation between ξ = the Health Expenditures in United States and ω = the Life Expectancy in United States, *a* and *b* will be [4]:

$$S=\sum_{i=1}^{n}(\lg\omega_i-\lg\omega_{\xi_i})^2=\min \Leftrightarrow S=\sum_{i=1}^{n}(\lg\omega_i-\lg a-\xi_i\lg b)^2=\min$$

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

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

$$\lg a = \frac{\begin{vmatrix} \sum_{i=1}^{n} \lg \omega_i & \sum_{i=1}^{n} \xi_i \\ \sum_{i=1}^{n} \xi_i \lg \omega_i & \sum_{i=1}^{n} \xi_i^2 \end{vmatrix}}{\begin{vmatrix} n & \sum_{i=1}^{n} \xi_i \\ \sum_{i=1}^{n} \xi_i & \sum_{i=1}^{n} \xi_i^2 \end{vmatrix}} = \frac{\sum_{i=1}^{n} \lg \omega_i \sum_{i=1}^{n} \xi_i^2 - \sum_{i=1}^{n} \xi_i \lg \omega_i \sum_{i=1}^{n} \xi_i}{n \sum_{i=1}^{n} \xi_i^2 - \left(\sum_{i=1}^{n} \xi_i \right)^2} \quad \lg b = \frac{\begin{vmatrix} n & \sum_{i=1}^{n} \lg \omega_i \\ \sum_{i=1}^{n} \xi_i & \sum_{i=1}^{n} \xi_i \lg \omega_i \end{vmatrix}}{\begin{vmatrix} n & \sum_{i=1}^{n} \xi_i \\ \sum_{i=1}^{n} \xi_i & \sum_{i=1}^{n} \xi_i^2 \end{vmatrix}} = \frac{n \cdot \sum_{i=1}^{n} \xi_i \lg \omega_i - \sum_{i=1}^{n} \lg \omega_i \sum_{i=1}^{n} \xi_i}{n \sum_{i=1}^{n} \xi_i^2 - \left(\sum_{i=1}^{n} \xi_i \right)^2}$$

Table 4. The exponential correlation between the Health Expenditures in United States and the Life Expectancy in United States, for the time interval 2000-2015

YEARS	HEALTH EXPENDITURES (%) G.D.P. U.S.A. (ξ_i)	LIFE EXPECTANCY U.S.A. (ω_i)	EXPONENTIAL TREND				
			$\lg \omega_i$	$\xi_i \lg \omega_i$	$\lg \omega_{\xi i} = \lg a + \xi_i \lg b$	$\omega_{\xi_i} = ab^{\xi_i}$	$\lvert \omega_i - \omega_{\xi_i} \rvert$
2000	**13,1**	**76,8**	1,885361220	24,69823198	1,923835773	83,91426076	7,1
2001	**13,7**	**77,0**	1,886490725	25,84492293	1,925705722	84,27635074	7,3
2002	**14,5**	**77,0**	1,886490725	27,35411552	1,928198992	84,76156983	7,8
2003	**15,1**	**77,2**	1,887617300	28,50302124	1,930068944	85,12731660	7,9
2004	**15,1**	**77,6**	1,889861721	28,53691199	1,930068944	85,12731660	7,9
2005	**15,2**	**77,6**	1,889861721	28,72589816	1,930380602	85,18842765	7,6
2006	**15,3**	**77,8**	1,890979597	28,93198783	1,930692261	85,24958257	7,5
2007	**15,6**	**78,1**	1,892651034	29,52535613	1,931627237	85,43331086	7,3
2008	**16,0**	**78,2**	1,893206753	30,29130805	1,932873872	85,67889801	7,5
2009	**17,0**	**78,5**	1,894869657	32,21278416	1,935990459	86,29595892	7,8
2010	**17,0**	**78,7**	1,895974732	32,23157045	1,935990459	86,29595892	7,6
2011	**17,1**	**78,7**	1,895974732	32,42116792	1,936302118	86,35790891	7,7
2012	**17,0**	**78,8**	1,896526217	32,24094570	1,935990459	86,29595892	7,5
2013	**16,9**	**78,8**	1,896526217	32,05129308	1,935678800	86,23405337	7,4
2014	**17,1**	**78,8**	1,896526217	32,43059832	1,936302118	86,35790891	7,6
2015	**17,8**	**79,3**	1,899273187	33,80706273	1,938483729	86,79280586	7,5
TOTAL	**253,5**	**1248,9**	30,27819176	479,8071762			121

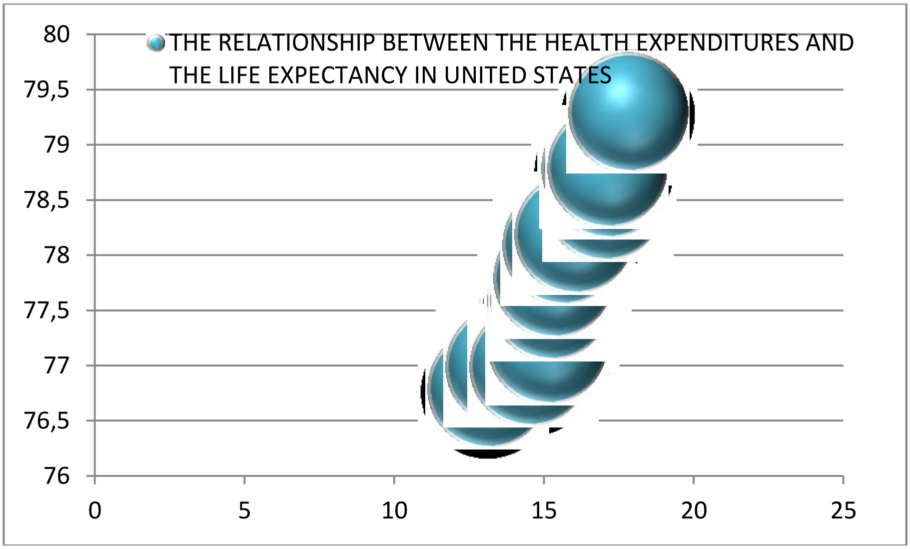
$$\lg a = \frac{\begin{vmatrix} \sum_{i=1}^{n} \lg \omega_i & \sum_{i=1}^{n} \xi_i \\ \sum_{i=1}^{n} \xi_i \lg \omega_i & \sum_{i=1}^{n} \xi_i^2 \end{vmatrix}}{\begin{vmatrix} n & \sum_{i=1}^{n} \xi_i \\ \sum_{i=1}^{n} \xi_i & \sum_{i=1}^{n} \xi_i^2 \end{vmatrix}} = \frac{\begin{vmatrix} 30,27819176 & 253,5 \\ 479,8071762 & 4044,33 \end{vmatrix}}{\begin{vmatrix} 16 & 253,5 \\ 253,5 & 4044,33 \end{vmatrix}} = 1,88300848$$

$$\lg b = \frac{\begin{vmatrix} n & \sum_{i=1}^{n} \lg \omega_i \\ \sum_{i=1}^{n} \xi_i & \sum_{i=1}^{n} \xi_i \lg \omega_i \end{vmatrix}}{\begin{vmatrix} n & \sum_{i=1}^{n} \xi_i \\ \sum_{i=1}^{n} \xi_i & \sum_{i=1}^{n} \xi_i^2 \end{vmatrix}} = \frac{\begin{vmatrix} 16 & 30{,}27819176 \\ 253{,}5 & 479{,}8071762 \end{vmatrix}}{\begin{vmatrix} 16 & 253{,}5 \\ 253{,}5 & 4044{,}33 \end{vmatrix}} = 0{,}003116587$$

$$v_{\exp} = \left[\frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{\xi_i}^{\exp} \right|}{n} : \frac{\sum_{i=1}^{n} \omega_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{\xi_i}^{\exp} \right|}{\sum_{i=1}^{n} \omega_i} \cdot 100 = \frac{121}{1248{,}9} \cdot 100 = 9{,}69\%$$

$$v_I = 0{,}19\% < v_{II} = 0{,}21\% < v_{\exp} = 9{,}69\%$$

Consequently, the „luminous spectrum" of the relationship between the Health Expenditures in United States and the Life Expectancy in United States, in the time interval 2000-2015, is a linear evolution $\omega_{\xi_i} = a + b \cdot \xi_i$, according to the graph 1.



Graph 1. The statistical architecture of the „luminous spectre" regarding the correlation between the Health Expenditures and the Life Expectancy in United States, in the time interval 2000-2015

5.2. The intensity of the correlation between the Health Expenditures and the Life Expectancy in United States, in the period 2000-2015

For to reflect the intensity of the linear correlation between the **Health Expenditures** and the **Life Expectancy** in United States, in the time interval 2000-2015, we use the Correlation Coefficient, according to the table 5:

$$r = \frac{n\sum_{i=1}^{n}\xi_i\omega_i - \sum_{i=1}^{n}\xi_i \cdot \sum_{i=1}^{n}\omega_i}{\sqrt{\left[n\sum_{i=1}^{n}\xi_i^2 - \left(\sum_{i=1}^{n}\xi_i\right)^2\right]\left[n\sum_{i=1}^{n}\omega_i^2 - \left(\sum_{i=1}^{n}\omega_i\right)^2\right]}} = \frac{16\cdot 19802,89 - 253,5\cdot 1248,9}{\sqrt{[16\cdot 4044,33 - (253,5)^2]\cdot[16\cdot 97493,73 - (1248,9)^2]}} = 0,970752767$$

Table 5. The correlation between the Health Expenditures and the Life Expectancy in U.S.A, in the time interval 2000-2015

YEARS	HEALTH EXPENDITURES (%) G.D.P. U.S.A (ξ_i)	LIFE EXPECTANCY U.S.A. (ω_i)	ξ_i^2	ω_i^2	$\xi_i\omega_i$
2000	**13,1**	**76,8**	171,61	5898,24	1006,08
2001	**13,7**	**77,0**	187,69	5929,00	1054,90
2002	**14,5**	**77,0**	210,25	5929,00	1111,50
2003	**15,1**	**77,2**	228,01	5959,84	1165,72
2004	**15,1**	**77,6**	228,01	6021,76	1171,76
2005	**15,2**	**77,6**	231,04	6021,76	1179,52
2006	**15,3**	**77,8**	234,09	6052,84	1190,34
2007	**15,6**	**78,1**	243,36	6099,61	1218,36
2008	**16,0**	**78,2**	256,00	6115,24	1251,20
2009	**17,0**	**78,5**	289,00	6162,25	1334,50
2010	**17,0**	**78,7**	289,00	6193,69	1337,90
2011	**17,1**	**78,7**	292,41	6193,69	1345,77
2012	**17,0**	**78,8**	289,00	6209,44	1339,60
2013	**16,9**	**78,8**	285,61	6209,44	1331,72
2014	**17,1**	**78,8**	292,41	6209,44	1347,48
2015	**17,8**	**79,3**	316,84	6288,49	1411,54
TOTAL	**253,5**	**1248,9**	4044,33	97493,73	19802,89

Because the value of the Correlation Coefficient tends to 1, there is a very strong intensity of the relationship between the Health Expenditures and the Life Expectancy in United States, in the time interval 2000-2015.

5.3. The „logic scheme" which expresses the way of the statistical modeling concerning the Health Expenditures in United States, between 2000-2017

In the time interval 2000-2017, we observe the next distribution regarding the Health Expenditures in United States:

Table 6. The Health Expenditures in United States, in the time interval 2000-2017

YEARS	HEALTH EXPENDITURES (%) G.D.P. UNITED STATES (ξ_i)	YEARS	HEALTH EXPENDITURES (%) G.D.P. UNITED STATES (ξ_i)
2000	13,1	2009	17,0
2001	13,7	2010	17,0
2002	14,5	2011	17,1
2003	15,1	2012	17,0
2004	15,1	2013	16,9
2005	15,2	2014	17,1
2006	15,3	2015	17,8
2007	15,6	2016	29,0
2008	16,0	2017	22,0

The source: „World Bank" 2017, New York, United States

In continuation, we want to select the real architecture of the model concerning the Health Expenditures in United States, between 2000-2017, according to the table 6.

- when the function $\xi_{t_i} = a + b \cdot t_i$ makes evident the existence of the viable modeling concerning the Health Expenditures in United States, *a* and *b* will be [4]:

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

Table 7. The computational algorithm for the values of ξ variable, if the Health Expenditures in United States emphasizes a linear evolution in the interval 2000-2017

YEARS	HEALTH EXPENDITURES (%) G.D.P. U.S.A. (ξ_i)	LINEAR TREND				
		t_i	t_i^2	$t_i\xi_i$	$\xi_{t_i} = a + bt_i$	$\lvert\xi_i - \xi_{t_i}\rvert$
2000	**13,1**	-9	81	-117,9	12,76403509	0,3
2001	**13,7**	-8	64	-109,6	13,22543860	0,5
2002	**14,5**	-7	49	-101,5	13,71004463	0,8
2003	**15,1**	-6	36	-90,6	14,17229833	0,9
2004	**15,1**	-5	25	-75,5	14,60964913	0,5
2005	**15,2**	-4	16	-60,8	15,07105263	0,1
2006	**15,3**	-3	9	-45,9	15,53245614	0,2
2007	**15,6**	-2	4	-31,2	15,99385965	0,4
2008	**16,0**	-1	1	-16,0	16,45526316	0,5
2009	**17,0**	+1	1	+17,0	17,37807018	0,4
2010	**17,0**	+2	4	+34,0	17,83947369	0,8
2011	**17,1**	+3	9	+51,3	18,30087719	1,2
2012	**17,0**	+4	16	+68,0	18,76228071	1,8
2013	**16,9**	+5	25	+84,5	19,22368421	2,3
2014	**17,1**	+6	36	+102,6	19,68508772	2,6
2015	**17,8**	+7	49	+124,6	20,14649123	2,3
2016	**29,0**	+8	64	+232,0	20,60789474	8,4
2017	**22,0**	+9	81	+198,0	21,06929825	0,9
TOTAL	**304,5**		570	263,0	**304,5**	24,9

$$a = \frac{\sum_{i=1}^{n}\xi_i \sum_{i=1}^{n} t_i^2 - \sum_{i=1}^{n}\xi_i t_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{304{,}5 \cdot 570 - 263 \cdot 0}{18 \cdot 570 - 0^2} = 16{,}91666667$$

$$b = \frac{n\sum_{i=1}^{n}\xi_i t_i - \sum_{i=1}^{n} t_i \sum_{i=1}^{n}\xi_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{18 \cdot 263 - 0 \cdot 304{,}5}{18 \cdot 570 - 0^2} = 0{,}461403508$$

$$v_I = \left[\frac{\sum_{i=1}^{n}\left|\xi_i - \xi_{t_i}^I\right|}{n} : \frac{\sum_{i=1}^{n}\xi_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{n}\left|\xi_i - \xi_{t_i}^I\right|}{\sum_{i=1}^{n} x_i} \cdot 100 = \frac{24{,}9}{304{,}5} \cdot 100 = 8{,}18\%$$

- when the function $\xi_{t_i} = a + b \cdot t_i + ct_i^2$ reflects the validation of the hypothesis regarding the viable modeling of the Health Expenditures in United States, *a* and *b* will be [4]:

Table 8. The computational algorithm for the values of ξ variable, if the Health Expenditures in U.S.A. emphasizes a parabolic evolution in the time interval 2000-2017

YEARS	HEALTH EXPENDI-TURES (%) G.D.P. U.S.A. (ξ_i)	PARABOLIC TREND						
		t_i	t_i^2	t_i^3	t_i^4	$t_i^2\xi_i$	$\xi_{t_i} = a + bt_i + ct_i^2$	$\lvert\xi_i - \xi_{t_i}\rvert$
2000	**13,1**	-9	81	-729	6561	1061,1	14,50610866	1,4
2001	**13,7**	-8	64	-512	4096	876,8	14,36720298	0,7
2002	**14,5**	-7	49	-343	2401	710,5	14,29892197	0,2
2003	**15,1**	-6	36	-216	1296	543,6	14,30126557	0,8
2004	**15,1**	-5	25	-125	625	377,5	14,37423377	0,7
2005	**15,2**	-4	16	-64	256	243,2	14,51782656	0,7
2006	**15,3**	-3	9	-27	81	137,7	15,04985467	0,2
2007	**15,6**	-2	4	-8	16	62,4	15,01688597	0,6
2008	**16,0**	-1	1	-1	1	16,0	15,37235257	0,3
2009	**17,0**	+1	1	+1	1	17,0	16,29515959	0,7
2010	**17,0**	+2	4	+8	16	68,0	16,86250000	0,1
2011	**17,1**	+3	9	+27	81	153,9	17,50046501	0,4
2012	**17,0**	+4	16	+64	256	272,0	18,20905463	1,2
2013	**16,9**	+5	25	+125	625	422,5	18,98826885	2,1
2014	**17,1**	+6	36	+216	1296	615,6	19,83810766	2,7
2015	**17,8**	+7	49	+343	2401	872,2	20,75857109	3,0
2016	**29,0**	+8	64	+512	4096	1856,0	21,74965911	7,2
2017	**22,0**	+9	81	+729	6561	1782,0	22,81137180	0,8
TOTAL	**304,5**		570		30666	10088,0	**304,5**	23,8

$$a = \frac{\sum_{i=1}^{n} t_i^4 \sum_{i=1}^{n} \xi_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} t_i^2 \xi_i}{n\sum_{i=1}^{n} t_i^4 - (\sum_{i=1}^{n} t_i^2)^2} = \frac{30666 \cdot 304{,}5 - 570 \cdot 10088}{18 \cdot 30666 - 570^2} = 15{,}79844378$$

$$b = \frac{\sum_{i=1}^{n} \xi_i t_i}{\sum_{i=1}^{n} t_i^2} = \frac{263}{570} = 0{,}461403508$$

$$c = \frac{n\sum_{i=1}^{n} t_i^2 \xi_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} \xi_i}{n\sum_{i=1}^{n} t_i^4 - (\sum_{i=1}^{n} t_i^2)^2} = \frac{18 \cdot 10088 - 570 \cdot 304{,}5}{18 \cdot 30666 - 570^2} = 0{,}035312301$$

$$v_{II} = \left[\frac{\sum_{i=1}^{n} \left|\xi_i - \xi_{t_i}^{II}\right|}{n} : \frac{\sum_{i=1}^{n} \xi_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left|\xi_i - \xi_{t_i}^{II}\right|}{\sum_{i=1}^{n} \xi_i} \cdot 100 = \frac{23{,}8}{304{,}5} \cdot 100 = 7{,}82\%$$

- when the function $\xi_{t_i} = ab^{t_i}$ reveals the real modeling concerning the Health Expenditures in United States, *a* and *b* will be [4]:

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

$$\lg a = \frac{\sum_{i=1}^{n} \lg \xi_i \sum_{i=1}^{n} t_i^2 - \sum_{i=1}^{n} t_i \lg \xi_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{21{,}97755973 \cdot 570 - 0 \cdot 6{,}264122632}{18 \cdot 570 - 0^2} = 1{,}22097554$$

$$\lg b = \frac{n \cdot \sum_{i=1}^{n} t_i \lg \xi_i - \sum_{i=1}^{n} \lg \xi_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{18 \cdot 6{,}264122632 - 21{,}97755973 \cdot 0}{18 \cdot 570 - 0^2} = 0{,}010989688$$

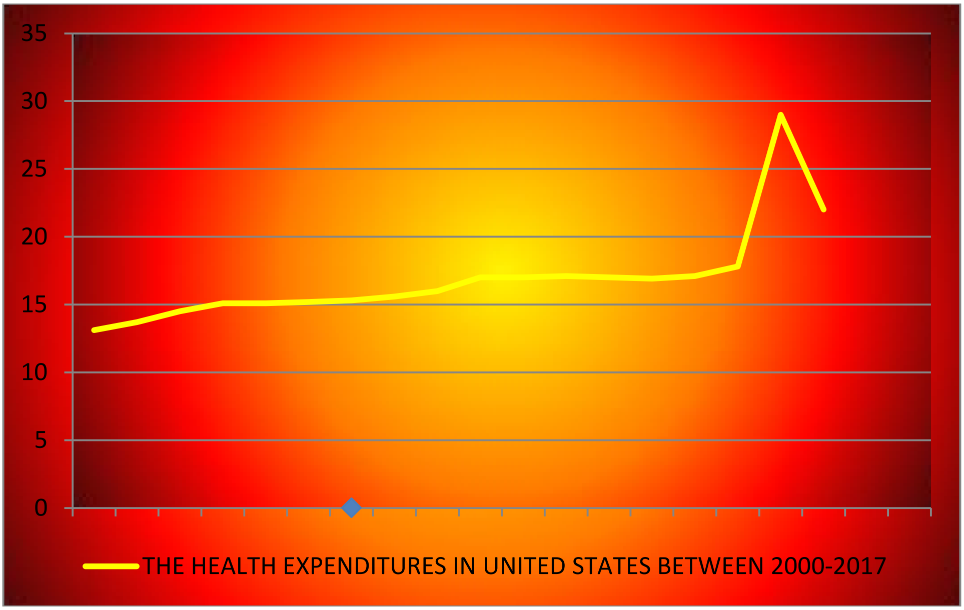
Table 9. The computational algorithm for the values of ξ variable, if the Health Expenditures in U.S.A. emphasizes an exponential evolution in the interval 2000-2017

YEARS	HEALTH EXPEND. (%) G.D.P. U.S.A. (ξ_i)	EXPONENTIAL TREND					
		t_i	$\lg \xi_i$	$t_i \lg \xi_i$	$\lg \xi_{ti} = \lg a + t_i \lg b$	$\xi_{ti} = ab^{t_i}$	$\lvert \xi_i - \xi_{t_i} \rvert$
2000	**13,1**	-9	1,117271296	-10,05544166	1,122068348	13,24549973	0,1
2001	**13,7**	-8	1,136720567	-9,093764537	1,133058036	13,58494974	0,1
2002	**14,5**	-7	1,161368002	-8,129576016	1,144047724	13,93309903	0,6
2003	**15,1**	-6	1,178976947	-7,073861684	1,155037412	14,29017055	0,8
2004	**15,1**	-5	1,178976947	-5,894884736	1,166027100	14,65639294	0,4
2005	**15,2**	-4	1,181843588	-4,727374352	1,177016788	15,03200072	0,2
2006	**15,3**	-3	1,184691431	-3,554074292	1,188006476	15,41723442	0,1
2007	**15,6**	-2	1,193124598	-2,386249197	1,198996164	15,81234073	0,2
2008	**16,0**	-1	1,204119983	-1,204119983	1,209985852	16,21757265	0,2
2009	**17,0**	+1	1,230448921	1,230448921	1,231965228	17,05945796	0,1
2010	**17,0**	+2	1,230448921	2,460897843	1,242954916	17,49665047	0,5
2011	**17,1**	+3	1,232996110	3,698988331	1,242954916	17,49665047	0,5
2012	**17,0**	+4	1,230448921	4,921795686	1,253944604	17,94504716	0,9
2013	**16,9**	+5	1,227886705	6,139433523	1,275923980	18,87660899	2,0
2014	**17,1**	+6	1,232996110	7,397976662	1,286913668	19,36037067	2,3
2015	**17,8**	+7	1,250420002	8,752940016	1,297903356	19,85652999	2,1
2016	**29,0**	+8	1,462397998	11,69918398	1,308893044	20,36540466	8,6
2017	**22,0**	+9	1,342422681	12,08180413	1,319882732	20,88732056	1,1
TOTAL	**304,5**		21,97755973	6,264122632			20,8

$$v_{\exp} = \left[\frac{\sum_{i=1}^{n} \left| \xi_i - \xi_{t_i}^{\exp} \right|}{n} : \frac{\sum_{i=1}^{n} \xi_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \xi_i - \xi_{t_i}^{\exp} \right|}{\sum_{i=1}^{n} \xi_i} \cdot 100 = \frac{20{,}8}{304{,}5} \cdot 100 = 6{,}83\%$$

$$v_{\exp} = 6{,}83\% < v_{II} = 7{,}82\% < v_I = 8{,}18\%$$

The architecture of the path describes by ξ factor, which displays the Health Expenditures in United States, between 2000-2017, is an exponential dynamic $\xi_{t_i} = ab^{t_i}$, according to the graph 2.



Graph 2. The statistical model of the values which expresses the exponential dynamic of the Health Expenditures in United States, in the time interval 2000-2017

5.4. The statistical forecasts of the values for the Health Expenditures in United States

The dynamics of the values for the Health Expenditures in United States, in the time interval 2000-2017, reflects an exponential function

$\xi_{t_i} = ab^{t_i}$. Consequently, between 2018-2030 the values for the Health Expenditures will be:

$$\xi_{2018}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{10} = 21,42261186 \approx 21,5(\%) G.D.P.$$
$$\xi_{2019}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{11} = 21,97162141 \approx 22,0(\%) G.D.P.$$
$$\xi_{2020}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{12} = 22,53470074 \approx 22,5(\%) G.D.P.$$
$$\xi_{2021}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{13} = 23,11221043 \approx 23,1(\%) G.D.P.$$
$$\xi_{2022}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{14} = 23,70452029 \approx 23,7(\%) G.D.P.$$
$$\xi_{2023}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{15} = 24,31200962 \approx 24,3(\%) G.D.P.$$
$$\xi_{2024}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{16} = 24,93506742 \approx 25,0(\%) G.D.P.$$
$$\xi_{2025}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{17} = 25,57409268 \approx 25,6(\%) G.D.P.$$
$$\xi_{2026}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{18} = 26,22949461 \approx 26,2(\%) G.D.P.$$
$$\xi_{2027}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{19} = 26,90169289 \approx 26,9(\%) G.D.P.$$
$$\xi_{2028}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{20} = 27,59111799 \approx 27,6(\%) G.D.P.$$
$$\xi_{2029}^{HEALTH\_EXPENDITURES\_UNITED\_STATES} = 16,63318968 \cdot 1,025627573^{21} = 28,29821138 \approx 28,3(\%) G.D.P.$$

5.5. The „spectral analysis" which reflects the „energy points" of the „decoding" regarding the „cryptogram" of the statistical modeling for the Life Expectancy in United States, between 2000-2017

Table 10. The values regarding the Life Expectancy in United States, in the time interval 2000-2017

YEARS	LIFE EXPECTANCY UNITED STATES (years) (ω_i)
2000	76,8
2001	77,0
2002	77,0
2003	77,2
2004	77,6
2005	77,6
2006	77,8
2007	78,1
2008	78,2
2009	78,5
2010	78,7
2011	78,7
2012	78,8
2013	78,8
2014	78,8
2015	79,3
2016	79,8
2017	79,9

The source: „Human Development Report 2000-2016", New York, United States
„Central Intelligence Agency – The World Factbook", Washington D.C., United States

- when the function $\omega_{t_i} = a + b \cdot t_i$ shows the viability of the modeling concerning the Life Expectancy United States, *a* and *b* will be [4]:

$$a = \frac{\begin{vmatrix} \sum_{i=1}^{n} \omega_i & \sum_{i=1}^{n} t_i \\ \sum_{i=1}^{n} \omega_i t_i & \sum_{i=1}^{n} t_i^2 \end{vmatrix}}{\begin{vmatrix} n & \sum_{i=1}^{n} t_i \\ \sum_{i=1}^{n} t_i & \sum_{i=1}^{n} t_i^2 \end{vmatrix}} = \frac{\sum_{i=1}^{n} \omega_i \sum_{i=1}^{n} t_i^2 - \sum_{i=1}^{n} \omega_i t_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{1408{,}6 \cdot 570 - 14 \cdot 0}{18 \cdot 570 - 0^2} = 78{,}25555556$$

$$b = \frac{\begin{vmatrix} n & \sum_{i=1}^{n} \omega_i \\ \sum_{i=1}^{n} t_i & \sum_{i=1}^{n} \omega_i t_i \end{vmatrix}}{\begin{vmatrix} n & \sum_{i=1}^{n} t_i \\ \sum_{i=1}^{n} t_i & \sum_{i=1}^{n} t_i^2 \end{vmatrix}} = \frac{n\sum_{i=1}^{n} \omega_i t_i - \sum_{i=1}^{n} t_i \sum_{i=1}^{n} \omega_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{18 \cdot 14 - 0 \cdot 1408{,}6}{18 \cdot 570 - 0^2} = 0{,}024561403$$

Table 11. The computational algorithm for the values of ω variable, if the Life Expectancy in U.S.A. emphasizes a linear evolution between 2000-2017

YEARS	LIFE EXPECTANCY U.S.A. (years) (ω_i)	LINEAR TREND				
		t_i	t_i^2	$t_i\omega_i$	$\omega_{t_i} = a + bt_i$	$\lvert\omega_i - \omega_{t_i}\rvert$
2000	**76,8**	-9	81	-691,2	78,03450293	1,2
2001	**77,0**	-8	64	-616,0	78,05906434	1,1
2002	**77,0**	-7	49	-616,0	78,08362574	1,1
2003	**77,2**	-6	36	-463,2	78,10818714	0,9
2004	**77,6**	-5	25	-388,0	78,13274855	0,5
2005	**77,6**	-4	16	-310,4	78,15730995	0,6
2006	**77,8**	-3	9	-233,4	78,18187135	0,4
2007	**78,1**	-2	4	-156,2	78,20643275	0,1
2008	**78,2**	-1	1	-78,2	78,23099416	0,0
2009	**78,5**	+1	1	+78,5	78,28011696	0,1
2010	**78,7**	+2	4	+157,4	78,30467837	0,4
2011	**78,7**	+3	9	+236,1	78,32923977	0,4
2012	**78,8**	+4	16	+315,2	78,35380117	0,4
2013	**78,8**	+5	25	+394,0	78,37836258	0,4
2014	**78,8**	+6	36	+472,8	78,40292399	0,4
2015	**79,3**	+7	49	+555,1	78,42748535	0,9
2016	**79,8**	+8	64	+638,4	78,45204678	1,3
2017	**79,9**	+9	81	+719,1	78,47660819	1,4
TOTAL	**1408,6**		570	14	**1408,6**	11,6

$$v_I = \left[\frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{t_i}^I \right|}{n} : \frac{\sum_{i=1}^{m} \omega_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{t_i}^I \right|}{\sum_{i=1}^{n} \omega_i} \cdot 100 = \frac{11{,}6}{1408{,}5} \cdot 100 = 0{,}82\%$$

- when the function $\omega_{t_i} = a + b \cdot t_i + ct_i^2$ brings it to light the existence of the viable modeling concerning the Life Expectancy in United States, *a* and *b* will be [4]:

$$a = \frac{\sum_{i=1}^{n} t_i^4 \sum_{i=1}^{n} \omega_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} t_i^2 \cdot \omega_i}{n \sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2 \right)^2} = \frac{30666 \cdot 1408{,}6 - 570 \cdot 44607{,}4}{18 \cdot 30666 - 570^2} = 78{,}25120482$$

$$b = \frac{\sum_{i=1}^{n} \omega_i t_i}{\sum_{i=1}^{n} t_i^2} = 0{,}024561403 \qquad c = \frac{n \cdot \sum_{i=1}^{n} t_i^2 \cdot \omega_i - \sum_{i=1}^{n} t_i^2 \cdot \sum_{i=1}^{n} \omega_i}{n \sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2 \right)^2} = \frac{18 \cdot 44607{,}4 - 570 \cdot 1408{,}6}{18 \cdot 30666 - 570^2} = 0{,}00014$$

Table 12. The computational algorithm for the values of ω variable, if the Life Expectancy in U.S.A. emphasizes a parabolic evolution between 2000-2017

YEARS	LIFE EXPECTANCY U.S.A. (years) (ω_i)	PARABOLIC TREND						
		t_i	t_i^2	t_i^3	t_i^4	$t_i^2 \omega_i$	$\omega_{t_i} = a + bt_i + ct_i^2$	$\lvert \omega_i - \omega_{t_i} \rvert$
2000	**76,8**	-9	81	-729	6561	6220,8	78,04128086	1,2
2001	**77,0**	-8	64	-512	4096	4928,0	78,06350662	1,1
2002	**77,0**	-7	49	-343	2401	3773,0	78,08600716	1,1
2003	**77,2**	-6	36	-216	1296	2779,2	78,10878248	0,9
2004	**77,6**	-5	25	-125	625	1940,0	78,13183258	0,5
2005	**77,6**	-4	16	-64	256	1241,6	78,15515746	0,6
2006	**77,8**	-3	9	-27	81	700,2	78,17999365	0,4
2007	**78,1**	-2	4	-8	16	312,4	78,20263158	0,1
2008	**78,2**	-1	1	-1	1	78,2	78,22678081	0,0
2009	**78,5**	+1	1	+1	1	78,5	78,27590361	0,2
2010	**78,7**	+2	4	+8	16	314,8	78,30087719	0,4
2011	**78,7**	+3	9	+27	81	708,3	78,32612555	0,4
2012	**78,8**	+4	16	+64	256	1260,8	78,35164869	0,4
2013	**78,8**	+5	25	+125	625	1970,0	78,37744661	0,4
2014	**78,8**	+6	36	+216	1296	2836,8	78,40351931	0,4
2015	**79,3**	+7	49	+343	2401	3885,7	78,42986680	0,9
2016	**79,8**	+8	64	+512	4096	5107,2	78,45648907	1,3
2017	**79,9**	+9	81	+729	6561	6471,9	78,48338612	1,4
TOTAL	**1408,6**		570		30666	44607,4	**1408,6**	11,7

$$v_{II} = \left[\frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{t_i}^{II} \right|}{n} : \frac{\sum_{i=1}^{n} \omega_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{t_i}^{II} \right|}{\sum_{i=1}^{n} \omega_i} \cdot 100 = \frac{11,7}{1408,6} \cdot 100 = 0,83\%$$

- when the function $\omega_{t_i} = ab^{t_i}$ gives the green light for the existence of the viable modeling concerning the Life Expectancy in United States, *a* and *b* will be [4]:

$$\lg a = \frac{\sum_{i=1}^{n} \lg \omega_i \sum_{i=1}^{n} t_i^2 - \sum_{i=1}^{n} t_i \lg \omega_i \sum_{i=1}^{n} t_i}{n \sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i \right)^2} = \frac{34,08274143 \cdot 570 - \cdot 0,504974266 \cdot 0}{18 \cdot 570 - 0^2} = 1,893485635$$

$$\lg b = \frac{n \cdot \sum_{i=1}^{n} t_i \lg \omega_i - \sum_{i=1}^{n} \lg \omega_i \sum_{i=1}^{n} t_i}{n \sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i \right)^2} = \frac{18 \cdot 0,504974266 - 34,08274143 \cdot 0}{18 \cdot 570 - 0^2} = 0,000885919$$

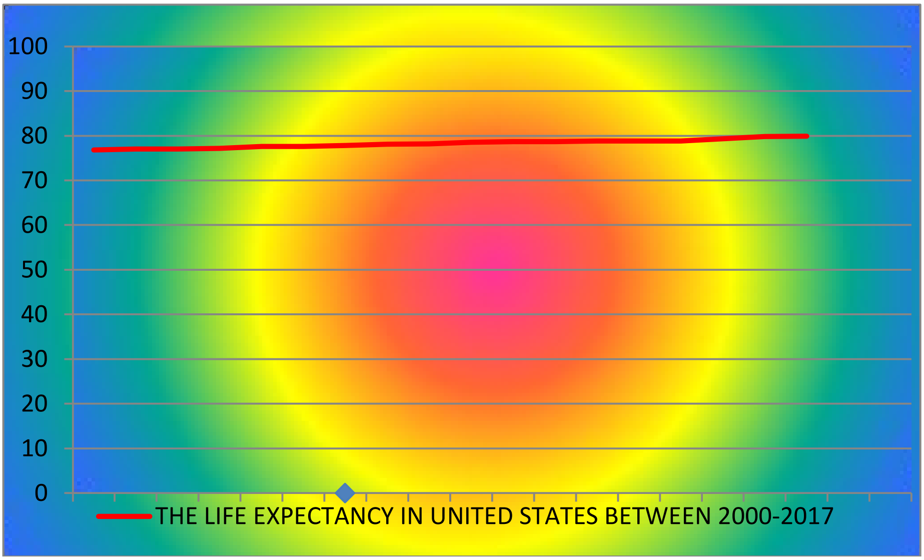
Table 13. The computational algorithm for the values of ω variable, if the Life Expectancy in U.S.A. emphasizes an exponential evolution between 2000-2017

YEARS	LIFE EXPECTANCY U.S.A. (years) (ω_i)	EXPONENTIAL TREND				
		$\lg \omega_i$	$t_i \lg \omega_i$	$\lg \omega_{ti} = \lg a + t_i \lg b$	$\omega_{ti} = ab^{t_i}$	$\lvert \omega_i - \omega_{t_i} \rvert$
2000	**76,8**	1,885361220	-16,96825098	1,885512364	76,82673273	0,03
2001	**77,0**	1,886490725	-15,09192580	1,886398283	76,98361183	0,02
2002	**77,0**	1,886490725	-13,20543508	1,887284202	77,14081128	0,14
2003	**77,2**	1,887617300	-11,32570380	1,888170121	77,29833173	0,10
2004	**77,6**	1,889861721	-9,449308606	1,889056040	77,45617384	0,14
2005	**77,6**	1,889861721	-7,559446885	1,889941959	77,61433825	0,01
2006	**77,8**	1,890979597	-5,672938791	1,890827878	77,77282564	0,03
2007	**78,1**	1,892651034	-3,785302068	1,891713797	77,93163665	0,17
2008	**78,2**	1,893206753	-1,893206753	1,892599716	78,09077195	0,11
2009	**78,5**	1,894869657	1,894869657	1,894371554	78,41001808	0,09
2010	**78,7**	1,895974732	3,791949465	1,895257473	78,57013023	0,13
2011	**78,7**	1,895974732	5,687924197	1,896143392	78,73056933	0,03
2012	**78,8**	1,896526217	7,586104870	1,897029311	78,89133604	0,09
2013	**78,8**	1,896526217	9,482631087	1,897915230	79,05243104	0,25
2014	**78,8**	1,896526217	11,37915730	1,898801149	79,21385499	0,41
2015	**79,3**	1,899273187	13,29491231	1,899687068	79,37560856	0,08
2016	**79,8**	1,902002891	15,21602313	1,900572987	79,53769244	0,26
2017	**79,9**	1,902546779	17,12292101	1,901458906	79,70010728	0,20
TOTAL	**1408,6**	34,08274143	0,504974266			2,29

$$v_{\exp} = \left[\frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{t_i}^{\exp} \right|}{n} : \frac{\sum_{i=1}^{n} \xi_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{t_i}^{\exp} \right|}{\sum_{i=1}^{n} \omega_i} \cdot 100 = \frac{2{,}29}{1408{,}6} \cdot 100 = 0{,}16\%$$

$$v_{\exp} = 0{,}16\% < v_I = 0{,}82\% < v_{II} = 0{,}83\%$$

The profile of the path describes by ω factor, which displays the Life Expectancy in United States, between 2000-2017, is an exponential dynamic $\omega_{t_i} = ab^{t_i}$, according to the graph 3.



Graph 3. The statistical model of the values which reflects the exponential dynamic of the Life Expectancy in United States, in the time interval 2000-2017

5.6. The statistical prognosis of the values for the Life Expectancy in United States

Because the dynamics of the values for the Life Expectancy in United States, in the time interval 2000-2017, expresses an exponential function $\omega_{t_i} = ab^{t_i}$, the forecasts of the Life Expectancy between 2018-2024, in United States, will be:

$$\omega_{2018}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{10} = 79,86285378 \approx 79,9 \text{ years}$$
$$\omega_{2019}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{11} = 80,02593269 \approx 80,0 \text{ years}$$
$$\omega_{2020}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{12} = 80,18934452 \approx 80,2 \text{ years}$$
$$\omega_{2021}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{13} = 80,35309004 \approx 80,4 \text{ years}$$
$$\omega_{2022}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{14} = 80,51716992 \approx 80,5 \text{ years}$$
$$\omega_{2023}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{15} = 80,68158486 \approx 80,7 \text{ years}$$
$$\omega_{2024}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{16} = 80,84633553 \approx 80,9 \text{ years}$$
$$\omega_{2025}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{17} = 81,01142261 \approx 81,0 \text{ years}$$
$$\omega_{2026}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{18} = 81,1768468 \approx 81,2 \text{ years}$$
$$\omega_{2027}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{19} = 81,34260879 \approx 81,3 \text{ years}$$
$$\omega_{2028}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{20} = 81,50870926 \approx 81,5 \text{ years}$$
$$\omega_{2029}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{21} = 81,6751489 \approx 81,7 \text{ years}$$
$$\omega_{2030}^{LIFE\_EXPECTANCY\_UNITED\_STATES} = 78,25023221 \cdot (1,002041986)^{22} = 81,84192841 \approx 81,8 \text{ years}$$

6. Discussions

The value expressed by the Correlation Coefficient, namely 0,97, reflects a powerful connection between the Health Expenditures and the Life Expectancy in the United States.

The mathematical model of the correlation between the Health Expenditures in the United States and the Life Expectancy in the United States is described by the parabolic function.

7. Conclusions

In synthesis, there is a strong and true partnership between the Health Expenditures and the Life Expectancy in United States, the power of the influence concerning the exponential rise of the Health Expenditures it's manifests on Life Expectancy, through an identical exponential growth of the Life Expectancy in United States, the both statistical indicators „breathe" in a simultaneously mode. So, between the dynamics of the „Health Expenditures Vector" in United States and the dynamics of the Life Expectancy in United States, really there is a „statistical connector" of the relationship between the „informatics interface" of the Health Expenditures and the „informatics interface" of the Life Expectancy.

References

[1]. Avakov A. Quality of Life, Balance of Power and Nuclear Weapons. New York: Algora Publishing House; 2012. pp. 76-86.
[2]. Baer HA, Singer M, Susser I. Medical Anthropology and the World System. Connecticut: Praeger Publishing House; 2003. pp. 74-84.
[3]. Garber S, Gates S, Mulcahy A. Redirecting Innovation in U.S. Health Care: Options to Decrease Spending and Increase Value. Washington: Library of Congress; 2014. pp. 28-34.
[4]. Gauss CF. Disquisitiones Arithmeticae and other papers on number theory. New York: Springer Publishing House; 1986. pp. 86-94.
[5]. Mc Donough E. Inside National Health Reform. Los Angeles: University of California Press; 2011. pp. 26-32.
[6]. Mossialos E, Wenzl M. International Profile of Health Care Systems. New York: The Commonwealth Fundation; 2015. pp. 64-84.