
Kondratiev type cyclicity of the Romanian economy, grounded in three key statistical indicators: GDP, CPI or CLI and debt

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Abstract

The evolution of the economies is certainly cyclical, and the “K” type waves, or type Kondratiev cycles, represent a perennial piece of evidence of this. Relatively criticized by many economic theories, with the ignorance typical of all those who try to disprove forecasts and projections in the field of business, and at the same time highly appreciated by those who prove a validated predictive power (which is the case of the Austrian school of economics), Kondratiev cycles, currently in their fifth stage, are the main target of the present paper. The introductory section is a reflection, simultaneously critical and appreciative, on cyclicity, while the arguments have a strong technological emphasis. To be credible and pragmatic, the applied method section has recourse to three favourite tools: gross domestic product (GDP) price consumer index (PCI) or cost of living index (CLI), and debt (public or external), paying due tribute to the constructors and international harmonizers, in point of statistics and instruments (from Nicholas Georgescu Roengen to Victor Axenciuc), who initiated and, respectively, completed a genuine epistemological process of the long cycle in modern Romanian economy, which this article presents, recognizing the quality of a supercycle to the Kondratiev cycle. The logic and useful nature of cyclical thinking, and its major importance today, conferred by the contribution of the Austrian school of economics, are included at the end of this article, generating a series of concluding remarks in a double perspective: that of an essay or statistical description, and and no less a critical analysis of the Kondratiev type cyclicity of the national economy.

Key words: Kondratiev cycle, supercycle, gross domestic product (GDP), price consumer index (PCI), cost of living index (CLI), public and external debt, modern Romanian economic cycles.

1. INTRODUCTION

Statistical thinking has measured causal relations, has simulate and anticipated the effects both for utopia, such as large-scale planning or centralization, and for dystopia, such as the crises, which, once becoming chronic, turned into deep recession, but it has always remained aware of its errors in the periodization of economic developments, seeking to continuously improve the quality of its forecasts.

A first approach to the issue of cyclicity, which was purely economic and of a structural onset, belonged to Jean Baptiste Say, who considered the cyclical evolution of the economy as a permanent integration of oscillations of the type “expansion et récession”, which became, in the English translation of typical terminology, “boom and boost”, and regarded, over one century, by James Mill, David Ricardo and John Stuart Mill, as a law of the markets defining early macroeconomics until 1928, when Nikolai Kondratiev published his findings in the shape of greatly detailed, rigorous and globalizing data, defining long-term capitalist business cycles in the form of waves having a periodicity of 50-60 years.

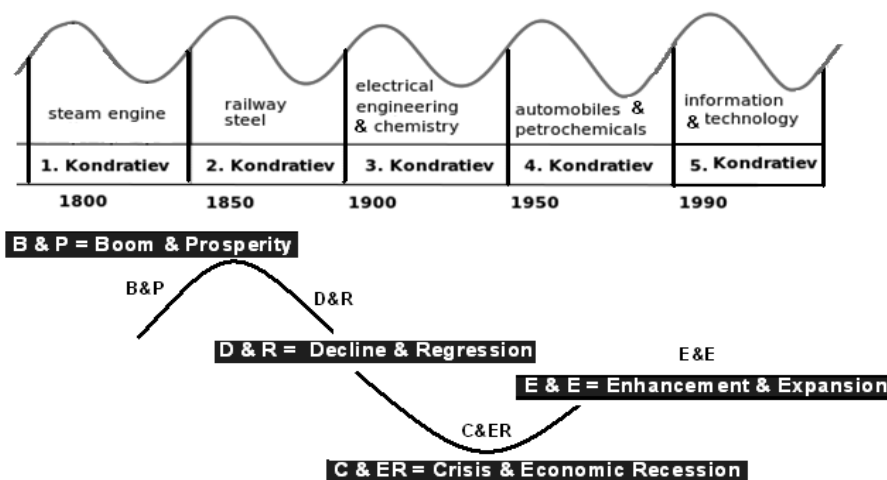
Today, these cycles bear his name (a simplified version of their name is “K” waves), and have a simultaneously descriptive and prescriptive role. Beyond its significance lies the ultimate heroism of Nikolai Kondratiev’s discovery, who actually was shot on the orders of Stalin in 1938, as he described the economy as cyclic and dynamically restructuring, thus arguing the very viability of the development of the capitalist economy in a socialist academy.

The statistical analysis of economic data accumulated over time in the global economy and in the various national economies led to the identification and the emergence of a number of theories concerning several types of cycles that overlap and intertwine, some of them standing out through their impact and importance: a) *the many-century cycles*, visually perceivable as rings as a reversible S curve (Gaston Imbert, 1959; Luigi Scandella, 1998); b) *the hegemonic geopolitical and historical cycles* of about 150 years on average (Immanuel Wallerstein and Joshua S. Goldstein); c) *the long economic cycles, or supercycles* of 50 to 60 years (Kondratiev waves or “K” waves); d) *the average investment cycles* of 15 to 25 years (Kuznets); e) *the average economic cycles* of 8 to 10 years (Juglar cycles, named after, and to honour, Clement Juglar, Joseph Schumpeter’s teacher); f) the short economic, industrial or agricultural cycles (of about 40 months in the industrial Kitchin type cycle, and of about 30 months in the Hanau type); e) election cycles (46-50 months, or on average 4 years), etc.

A Kondratiev cycle's internal phases, explained by the cyclical evolution of scientific research and technological innovation, are similar in description to the seasons: a) spring is defined by a major influence of a new production factor, or more recently, of a new dominant technology, generating macroeconomic results and rising inflation), summer (reaching the maximum of the influence of the new factor or technology, and also the emergence of some uncertainty and opposite economic perceptions, double-digit inflation, or at least twice as high as the previous average), autumn (definable by placing on a false plateau of prosperity, with the expansion of debt, and credit expansion in the economy), and eventually winter, which is especially characterized by crisis and recession, deflation and excess debt, leading to the repudiation of debt, which has meantime become massive. To put it in a nutshell, cycles, which also include the Kondratiev type supercycles, are movements, more or less repeatable or biphasic regular, initially upward or accelerating, and finally downward or decelerating, characteristic of economic activities (either disaggregated or microeconomic, or aggregated or macroeconomic), and Fig. no.1 graphically confirms this delimitation or conceptualization.

The five historical Kondratiev type cycles in world economy

Fig. no.1



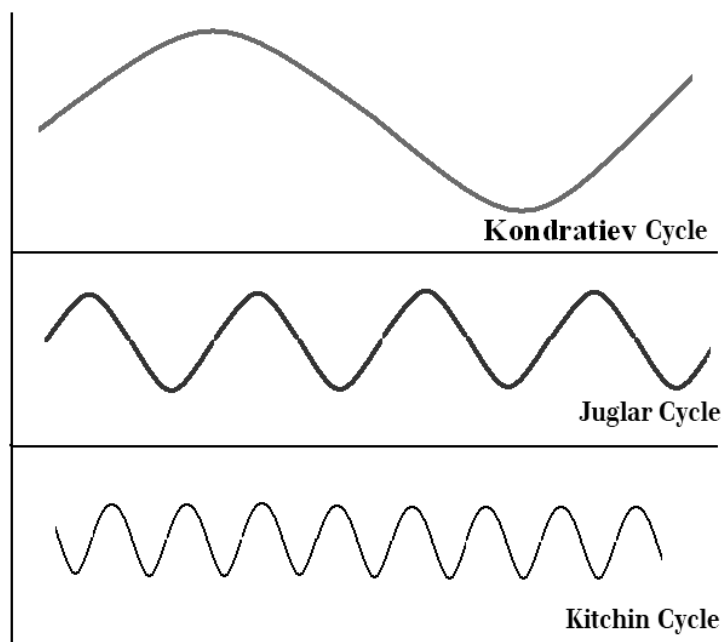
Source: Figure adapted from Kondratieff Wave.svg accessed on-line: http://en.wikipedia.org/wiki/File:Kondratieff_Wave.svg

After 1930, when Kondratiev cycles had been widely recognised in world literature, many of modern economics theorists noted and emphasized no fewer 19 Kondratiev type cycles, or waves, suggesting the collapse of the myth of economic supercycle, strictly limited in duration to about half a century. Still other studies evaluated relative maximum deviations of about 211 % for the average duration of a type “K” wave from 38 to 74 years (Mensch, 1979), some going down to details concerning the values in the upward phase from 16 to 43 years (170%), and others dealing with the values in the downward phase from 10 to 37 years (270%), to turn them into signals and even arguments for the lack of conceptual homogeneity of a Kondratiev cycle in spatially or temporally particularized analyses (Bosserele, 2001). According to another general finding, long-term, medium-term or short-term economic cycles coexist and mutually reinforce the political or electoral cycles, delineating the specificity of a fluctuating development in any of world’s economies.

The dominant logic needed for building a Kondratiev cycle is connected with the profound, uninterrupted changes occurring in production and marketing techniques, coupled with the evolution and impact of the inventions that are applied in the industry at the end of a cycle and the beginning of the next, fragmenting their evolution and generating the expansion of their orbit of influence in global economic relations, in parallel with the upstream-to-downstream transfer of changes or shifts, that is from the agricultural and extractive activities in the primary sector to the secondary and tertiary sector as a whole (Schumpeter, 1990). This first constructive variant was structurally deepened by Joseph Schumpeter, and intercalated into the economic thinking of development by the substratification, in the Kondratiev supercycle, of the Juglar subcycles, which have also four stages, stages that are however redefined by the concepts of recovery and boom, or prosperity and thriving (up to the modal of ascending dynamics), by decline and crisis, recession or anticlimax (up to an evolutionary antimodal). With Joseph Schumpeter, any initiation of a new “K” wave is practically identified with innovation as a phenomenon of creative destruction or irreversible historical change in the manner of producing goods and services, placing them on the market, opening new markets, and even building new organizations. The diagram of the Kondratiev supercycle as a Juglar type multicycle and structural Kitchin or Hanau subcycles is actually the synthesis of economic thought in the last century, oscillatingly evolutionary or cyclic, as shown in a summarized form in Fig. no. 2:

Substratification of cycles in economic theory, from the Kondratiev wave, through Juglar, to Kitchin

Fig. no. 2



Source: The stratified graph is the expression of the authors' statistical thinking

The criticism of the Kondratiev type cyclicity originate in the exogeneity of the variables (armed conflict, conflagration, revolutions, etc.), and the theorists of socialism were the first to reject their form rather than their essence, reconsidering form, for that reason, as the schematicism of the cycles. Some U.S. economic theories considered the importance given to cyclicity as exaggerated: Paul Samuelson, for example, sees cyclical analysis as placed more in the field of *science fiction*, while Stiglitz points out that the idea of cycle suggests *some regularity that is not really there* (Stiglitz, 2002).

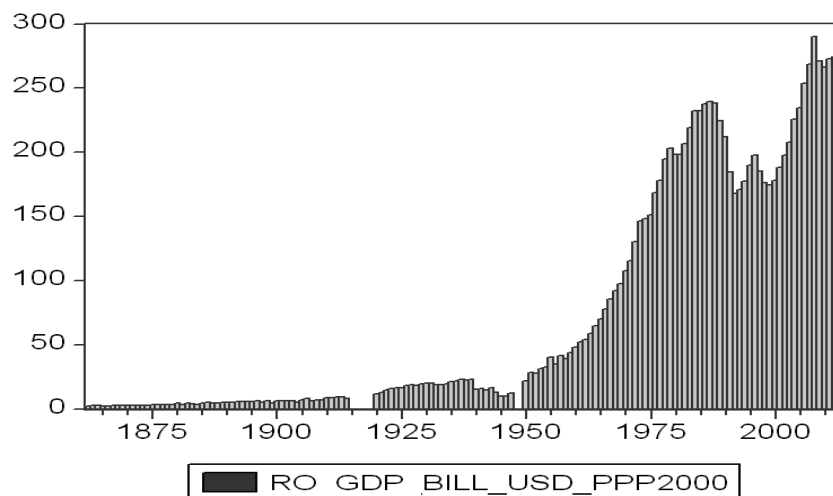
An economic cycle, and especially a long cycle, creates economic history, and the economy is, and remains, a succession of moments, whose history, internal and external correlations are a set of additions made by the researchers and theorists who are writing the history of a science or discipline. The fragmented universe of the Kondratiev cycles describes and transmits signals, while at the same time trying to find meanings, correlations and associations, which fully corresponds to statistical thinking in its interrogative and investigative cycles.

2. DATABASES AND METHOD IN CONSTRUCTING THE KONDRATIEV CYCLES OF ROMANIA'S MODERN ECONOMY

To become credible and pragmatic, this section of databases and applied method has had recourse to three favourite tools: gross domestic product (GDP), consumer price index (CPI), the cost of living index (CVI) as well as the debt (public or external), while paying due homage to the world-leading constructors and harmonizers in terms of statistics and instruments (from Nicholas Georgescu Roengen to Victor Axenciuc), who initiated and completed, respectively, a genuine epistemological process of the long cycle in the economy of modern Romania, which this article is presenting, in recognition of the quality of Kondratiev cycles as a historical supercycle endowed with signal virtues that are also valid in the national economy.

Dynamics of GDP in Romania between 1862 and 2013, according to the research conducted by Academician Victor Axenciuc

Fig. no. 3.
– bill. USD in PPP 2000-



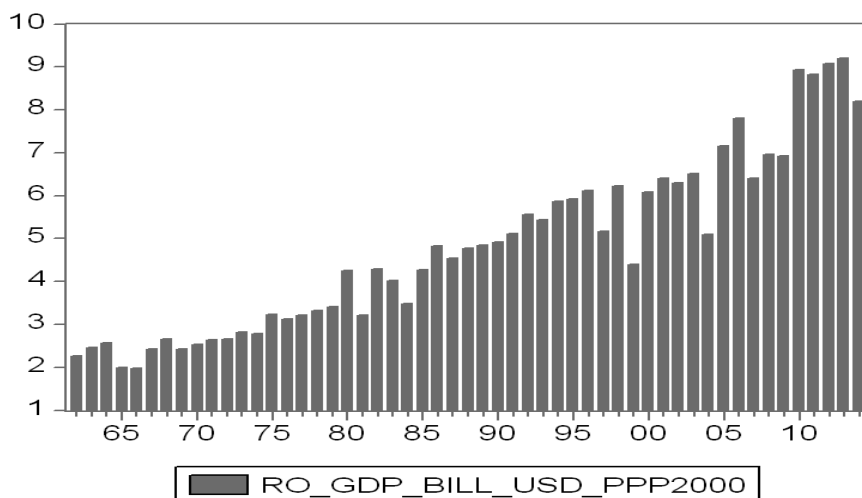
Source: Victor Axenciuc, (2012), *Romania's Gross Domestic Product 1862-2000: Century-long Statistical Series and Methodological Arguments*, vol I, Summary of time series for global indicators, by temporal sections, Economic Publishing House, Bucharest, pp. 38-40. The period 2001-2013 was updated by the authors, based on NSI and Eurostat.

Figure no. 3 shows the evolution of Romanian GDP from 1862 to the present, according to the data in *Annex 1* of this paper, which were published by Academician Victor Axenciuc in his 2012 paper of great historical, economic and statistical value; the data were updated to 2013 (the first national series data for a century and a half of the national economy, where the lack is easily observable of information during the two world wars, inertially including and / or a few subsequent years, viz. 1915 - 1919 and 1948-1950).

From the Union of Romanian Principalities, up to the making of the modern state of Greater Romania in 1918, as a result of the collapse of the big empires and following *the assertion of the Wilsonian principle of the right of nations to self-determination* (Cazacu, 2006), the progress of smaller Romania was still upward, as can be noted in Fig. 4, with numerous interruptions and downward trends, which were steeper after 1895, thus foreshadowing a specific Kondratiev cycle of the national economy, which was, even at the time, slightly delayed and much more inertial.

Dynamics of GDP in United Romanian Principalities Romania between 1862 and 1914, according to the research conducted by Academician Victor Axenciuc

Fig. no. 4.
– bill. USD in PPP 2000-



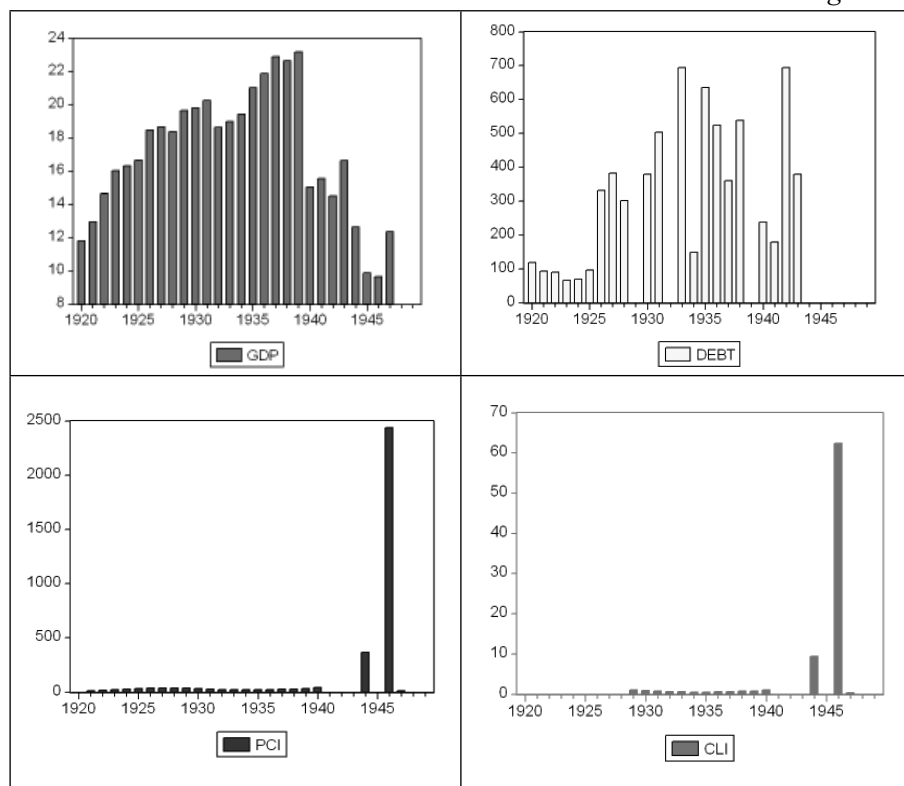
Source: Victor Axenciuc, (2012), *Romania's Gross Domestic Product 1862-2000: Century-long Statistical Series and Methodological Arguments*, vol I, Summary of time series for global indicators, by temporal sections, Economic Publishing House, Bucharest, pp. 38-39.

An acceptable historical and methodological periodization, or a delimitation of the Kondratiev type cycles, was considered to be more realistic if Romanian history was divided between 1920 and 1949, then from 1950 to 1989, and finally between 1990 and 2013, according to the concept of modern economy, adjusted to a number of complex considerations specific to the historical and economic development in this country. To identify synchronous or out-of-phase aspects, the analysis of trends and maturity of Romania's economy cyclical evolution in consonance with the "K" oscillations or waves in Europe and in the world global, three statistic constructions were used, two of which defined the specific inflationary trends, through instruments made and relatively harmonized by the authors (a secular index of Romanian inflation, and another of the cost of living, which are presented in Annexes 2 and 3), as well as a structural instrumental dynamics of Romania's debt from exports in the first cycle, from the gross national product (GNP) in the second, and, respectively, of government debt to gross domestic product (GDP) in the third cycle, which is still unfolding, an instrument developed by Camen Reinhart and Kenneth Rogoff in the first years of the 20th century for the vast majority of the countries of the world, to which was added the Eurostat data after 2000 (Annex 4).

The first Romanian Kondratiev cycle, or more precisely the first cycle of its modern economy, slightly compressed by the war, is described by means of GDP, CPI, and partly by CLI, together with debt expressed as a percentage of GNP, in Fig. no. 5:

**The first Kondratiev cycle of modern Romania (1920-1949)
in quadrants GDP, CPI, CLI and D/X**

Fig. no. 5

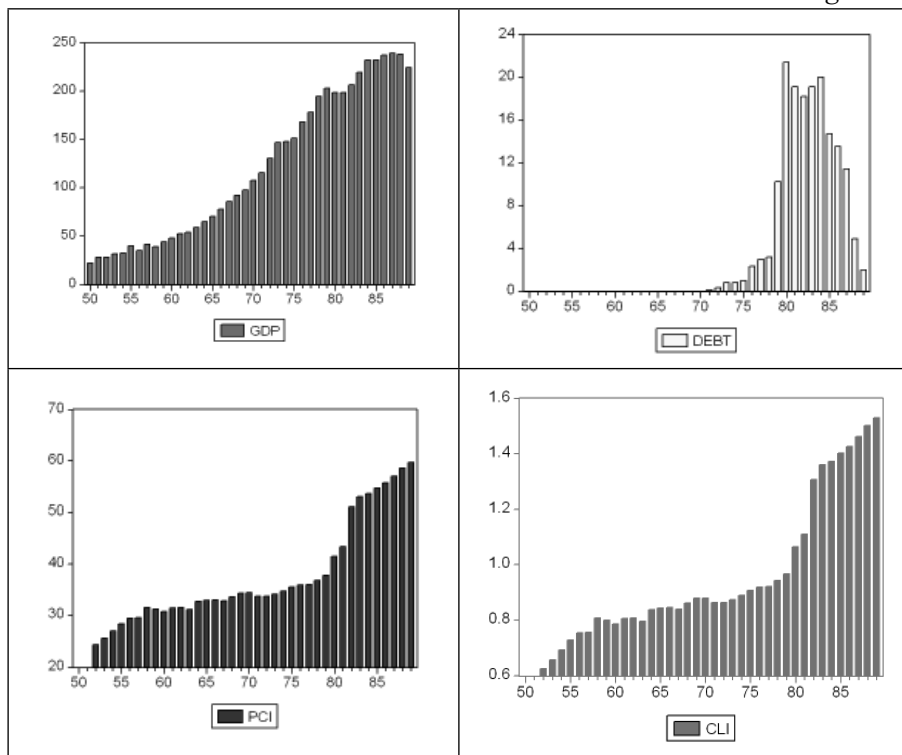


Source: Data from Annexes 1, 2, 3 and 4 of the paper

The main feature of the first Kondratiev cycle of Romania's modern economy is represented by the severe reduction in GDP after the outbreak of the Second World War (especially after 1940); this trend was followed by the disappearance of its values from the normal, or survival limit rather than the limit of development, after Soviet troops occupied Romania, when inflation reached unimaginable levels, damaging completely the cost of living, in parallel with an upward trend of debt that would assume huge proportions at the end of the war. The inertia of the destructiveness after World War II is evident in the Romanian economy: the country lost territories, wealth and growth factors, and covered its own survival by inflation, degradation of the cost of living and debt (Fig. no. 6).

**The second Kondratiev cycle of modern Romania (1950-1989)
in quadrants GDP, CPI, CLI and D/X**

Fig. no. 6



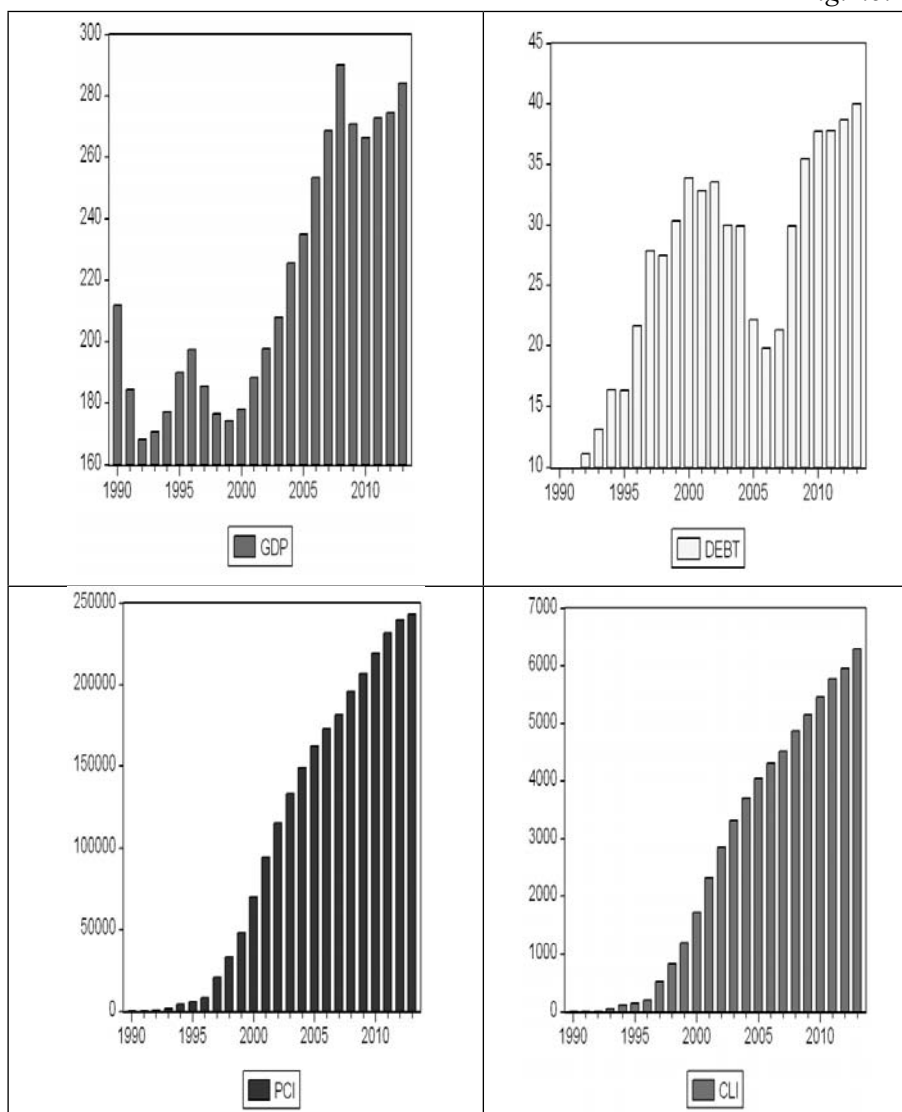
Source: Data from Annexes 1, 2, 3 and 4 of the paper

The apparent continuous increase in GDP during the second Kondratiev cycle is contradicted by the sharp rise in inflation in its last decade of the cycle, as well as the issue of external debt, which became a challenging issue after 1980; all that outline a downward cycle, which started after 1970 slowly, and became steep, during the 1980-1989 period. The sharp deterioration of the cost of living in the final part of the Kondratiev type cycle grows into one of the specific features of the Romanian cycle, and debt expansion also becomes repetitive and explosive on a short term.

The third “K” cycle is visible only in its first half (1990-2013), and the inertialness specific to modern Romanian economy was reconfirmed by the oscillations of GDP and debt; a slight improvement in the cost of living compared to inflation is easily observable in Fig. no. 7

The first part of the third Kondratiev cycle of modern Romania (1990-...), in quadrants GDP, CPI, CLI and D/X

Fig. no. 7



Source: Data from Annexes 1, 2, 3 and 4 of the paper

The specificity of each economy must also be combined with the superposition of distinct cycles, which can amplify or diminish certain stages, in point of temporal impact and results. This can be illustrated by Romania's

economy itself, which is under the influence of the latest global recession, being affected by three crises combined, which substantially increased the impact and duration and, especially, the losses recorded by the post-recession macroeconomic outcomes: a) reverting to the state of crisis, in keeping with the thirs Juglar cycle specific to Romania, after the onset of transition in 1990 (the Juglar cycle in the national economy begins with downward evolutions for at least two years on average); b) the election cycle and deepening crisis in the first year, or first two years after the elections, signaled by GDP growth in the last two years, show an upward inter-cycle trend (without the cycle from 1989 to 1992, which was forced into the analysis); c) the global crisis contagion (including the more intense impact of the crisis in emerging countries that were Eu candidates), and the superadded dynamics of Romania's increasing debt after the 2008-2010 recession.

Election cyclicity in the first half of the third Kondratiev cycle in Romania

Election cycle	Election year in the cycle analyzed			
	I	II	III	IV
1989-1992	-5,8	-5,6	-12,9	-8,84
1993-1996	1,51	3,97	7,16	4,01
1997-2000	-6,1	-4,79	-1,2	2,1
2001-2004	5,7	5,1	5,2	8,4
2005-2008	4,17	7,9	6	7,93
2009-2012	-6,57	-1,65	3,05	0,7

Source: <http://databank.worldbank.org/data/views/reports/tableview.aspx>

Regardless of the level of aggregation of statistical data in Romania's modern economy, internal associations between cycles are not optimized as they are for the large developed economies (in the U.S. economy an election cycle overlaps a Kitchin cycle, and the Juglar cycle was reduced to 4 ½ years, out of which the downward trends account for less than one and a half years, and the rest represents economic upswing and boom). In keeping with the history of the crises that occurred in the U.S. in the last two centuries, American cyclical crisis and deep recession are repeated with some regularity in the nineteenth century; the average economic cycle was then about 50 months, and the crisis covered the entire period with its expansion, in an approxiamtely parity manner (23-month and 27-month crisis expansion); the total cycle time was kept relatively a century later, with a slight increase of only four months, i.e. the average reaching 54 months, in the twentieth century, but the distribution changes substantially in favour of economic growth, which reaches an average of 39 months, compared with crisis, which goes down to

15 months. In a general cycle of the 33 crises (including the first, yet brief crisis of the 21st century, in March 2001, placed in the longest business cycle in the U.S., maintained in forced expansion until December 2007, the situation described, by 2008, a U.S. average cycle of 55 months (about four and a half years), when the average crisis shows a decreasing trend, reaching a duration of about one and a half years (17 months) and an economic expansion of over three years (38 months).

The broader inertia of GDP as a major economic result, the sharper expansion of debt at the end of the cycle and the relatively parallel developments in inflation and cost of living deterioration, with a slight offset favourable to the latter, outline the profile chart of the Kondratiev cycle of the national economy, in the light of such statistical tools, which did not exist, prior to the current decade, in the arsenal of analysis in Romania.

3. CONCLUSIONS

Paraphrasing Romanian logician Anton Dumitriu, *the truth about the cyclical character of economic activities and their ample waves evolutionary of the "K" type becomes a truth aiming at universality, valid now and everywhere*, and the Kondratiev cycle seems to be really hard to dispute today.

The Austrian School of Economics integrated Say's law, and all the major time cycles or fluctuations, into the business cycles, and after Friedrich Hayek, they were defined by the dynamics of macroeconomic outcomes as well as the dynamics of prices or inflation, by massive waves of unemployment and escalating debt, and even by state intervention in free markets, during the brief yet repetitive periods of crisis or during the longer economic recession periods, ineffectively blocking the natural balance of the factors of GDP and economic growth, and thus becoming more visible as technological influences in Kondratiev cycles too.

Economic cycles and their timely expression called business cycles, are today a statistical reality that no one can doubt. Real Business Cycle Theory (or RBS theory) is one of the most enduring theories of macroeconomic development. RBC is an alternative theory of the business cycle that summarizes an extensive class of macroeconomic models in which the shocks of business fluctuations can be counted as actual developments to a substantial extent (as opposed to the nominal approach). In RBC theory, the four primary economic fluctuations remain the trend (or the overall tendency), the cyclical character (business cycle), the seasonal character and the random trend. Unlike other theories derived from the concept of business cycle, in the RBC theory crises and recessions, as well as the periods of boom and

lower economic growth, appear as an efficient response to exogenous changes in the real economic environment. The RBC theory and the business cycle had ardent followers (e.g. Joseph Schumpeter), no less than fierce opponents (Irving Fisher, although he himself created a theory of fluctuations in business called “theory of business fluctuations”). Ludwig von Mises and Friedrich Hayek empirically anticipated the great 1929-1933 recession, and later other members of the Austrian school and followers of RBC predicted the 2007-2009 global recession in as accurate a manner.

The inflexion point in the economic cycle, whose cause ranges from pure technology with Kondratiev to innovation with Schumpeter, remains the most difficult factor to explain, the relevance of any judgment being impaired because cycles are influenced by combinations of inter-, trans- and multidisciplinary factors, and the economic result, the inflation or the price, the level of indebtedness and investment have a rather insignificant phenomenological determination in contradistinction to the pluralism of the residue of this complex of unidentified, ever-changing factors, coming from ever newer scientific fields, from demography to psychology and social behaviour.

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ANNEX I

**The evolution of GDP in Romania between 1862 and 2013
(in bill. USD - PPP 2000)**

Year	GDP	Year	GDP	Year	GDP	Year	GDP
1862	2,26	1900	6,08	1938	22,65	1976	168,20
1863	2,47	1901	6,41	1939	23,19	1977	178,30
1864	2,57	1902	6,29	1940	15,03	1978	194,78
1865	1,99	1903	6,52	1941	15,53	1979	202,91
1866	1,98	1904	5,10	1942	14,51	1980	198,46
1867	2,43	1905	7,16	1943	16,63	1981	198,60
1868	2,65	1906	7,81	1944	12,65	1982	206,65
1869	2,42	1907	6,40	1945	9,86	1983	219,22
1870	2,53	1908	6,97	1946	9,65	1984	232,23
1871	2,64	1909	6,93	1947	12,35	1985	232,20
1872	2,65	1910	8,93	1948	-	1986	237,39
1873	2,82	1911	8,82	1949	-	1987	239,41
1874	2,78	1912	9,08	1950	21,89	1988	238,30
1875	3,23	1913	9,21	1951	28,05	1989	224,38
1876	3,13	1914	8,19	1952	27,97	1990	211,81
1877	3,22	1915	-	1953	31,52	1991	184,40
1878	3,33	1916	-	1954	32,41	1992	168,09
1879	3,41	1917	-	1955	40,09	1993	170,59
1880	4,26	1918	-	1956	34,88	1994	177,24
1881	3,22	1919	-	1957	41,49	1995	189,86
1882	4,29	1920	11,82	1958	38,94	1996	197,43
1883	4,02	1921	12,96	1959	43,92	1997	185,39
1884	3,49	1922	14,63	1960	48,16	1998	176,53
1885	4,28	1923	16,03	1961	52,23	1999	174,37
1886	4,82	1924	16,29	1962	54,09	2000	177,97
1887	4,54	1925	16,66	1963	58,98	2001	188,21*
1888	4,77	1926	18,47	1964	64,77	2002	197,76*
1889	4,85	1927	18,67	1965	70,12	2003	208,05*
1890	4,92	1928	18,37	1966	78,00	2004	225,52*
1891	5,11	1929	19,65	1967	85,57	2005	234,93*
1892	5,56	1930	19,81	1968	91,98	2006	253,49*
1893	5,43	1931	20,27	1969	97,81	2007	268,70*
1894	5,87	1932	18,62	1970	107,59	2008	290,00*
1895	5,92	1933	18,98	1971	115,57	2009	270,93*
1896	6,12	1934	19,43	1972	130,34	2010	266,46*
1897	5,16	1935	21,03	1973	146,69	2011	273,00*
1898	6,22	1936	21,89	1974	148,06	2012	274,64*
1899	4,39	1937	22,91	1975	151,40	2013	284,25*

Sursa: Victor Axenciuc, (2012), *Romania's Gross Domestic Product 1862-2000: Century-long Statistical Series and Methodological Arguments*, vol I, Summary of time series for global indicators, by temporal sections, Economic Publishing House, Bucharest, pp. 38-40. Note* The period 2001-2013 was updated by the authors, based on NSI and Eurostat.

ANNEX 2

**Evolution of Romania's secular interpreter index (of the CPI type)
(An instrumental proposal)**

Year	Interpreter Index de of the CPI type		Year	Interpreter Index de of the CPI type		Year	Interpreter Index de of the CPI type	
1913	1,000	100,0	1947	243588,80	243588,80	1980	41,509	4150,9
1914	0,820	82,0	15.08 1947	The secondt great monetary reform		1981	43,312	4331,2
1915	-	-	1947	12,179	1217,9	1982	51,022	5102,2
1916	0,755	75,0	1948	-	-	1983	53,062	5306,2
1917	-	-	1949	-	-	1984	53,593	5359,3
1918	-	-	1950	-	-	1985	54,713	5471,3
1919	-	-	1951	-	-	1986	55,687	5568,7
1920	-	-	1952	24,360	2436,0	1987	57,027	5702,7
1921	11,330	1133,0	1953*	25,651	2565,1	1988	58,610	5861,0
1922	16,390	1639,0	1954*	27,015	2701,5	1989	59,682	5968,2
1923	23,880	2388,0	1955	28,452	2845,2	1990	62,727	6272,7
1924	29,850	2985,0	1956	29,451	2945,1	1991	169,497	16949,7
1925	32,500	3250,0	1957	29,524	2952,4	1992	526,079	52607,9
1926	35,520	3552,0	1958	31,497	3149,7	1993	1873,381	187338,1
1927	38,550	3855,0	1959	31,205	3120,5	1994	4434,275	443427,5
1928	39,640	3964,0	1960	30,669	3066,9	1995	5866,546	586654,6
7.02. 1929	The first great monetary reform		1961	31,400	3140,0	1996	8142,768	814276,8
1929	39,030	3903,0	1962	31,540	3154,0	1997	20747,802	2074780,2
1930	34,500	3450,0	1963	31,058	3205,8	1998	33009,749	3300974,9
1931	28,370	2837,0	1964	32,715	3271,5	1999	48128,214	4812821,4
1932	24,280	2428,0	1965	32,886	3288,6	2000	70122,808	7012280,8
1933	22,130	2213,0	1966	32,959	3295,9	2001	94315,176	9431517,6
1934	20,840	2084,0	1967	32,789	3278,9	2002	115536,091	11553609,1
1935	21,700	2170,0	1968	33,641	3364,1	2003	133213,113	13321311,3
1936	22,600	2260,0	1969	34,323	3432,3	2004	149065,474	14906547,4
1937	25,800	2580,0	1970	34,348	3434,8	2005	162481,366	16248136,6
1938	29,120	2912,0	1971	33,714	3371,4	2006	173140,144	17314014,4
1939	30,400	3040,0	1972	33,739	3373,9	2007	181520,127	18152012,7
1940	43,130	4313,0	1973	34,104	3410,4	2008	195769,457	19576945,7
1941	-	-	1974	34,737	3473,7	2009	206732,547	20673254,7
1942	-	-	1975	35,444	3544,4	2010	219322,559	21932255,9
1943	-	-	1976	35,858	3585,8	2011	232021,335	23202133,5
1944	364,800	36480,0	1977	35,980	3598,0	2012	239747,646	23974764,6
1945	-	-	1978	36,808	3680,8	1.12. 2013	239748,012	23974801,2
1946	-	-	1979	37,758	3775,8			

ANNEX 3

**Evolution of the cost of living interpreter index in Romania
(An instrumental proposal)**

Year	The cost of living index		Anul	The cost of living index		Year	The cost of living index	
	Coefficient	%		Coefficient	%		Coefficient	%
7.02. 1929	The first great monetary reform		1954	0,692	69,2	1984	1,373	137,3
1929	1,000	100,0	1955	0,729	72,9	1985	1,402	140,2
1930	0,884	88,4	1956	0,755	75,5	1986	1,427	142,7
1931	0,727	72,7	1957	0,756	75,6	1987	1,461	146,1
1932	0,622	62,2	1958	0,807	80,7	1988	1,502	150,2
1933	0,567	56,7	1959	0,800	80,0	1989	1,529	152,9
1934	0,534	53,4	1960	0,786	78,6	1990	1,607	160,7
1935	0,556	55,6	1961	0,805	80,5	1991	4,323	432,3
1936	0,579	57,9	1962	0,808	80,8	1992	13,336	1333,6
1937	0,661	66,1	1963	0,796	79,6	1993	47,427	4742,7
1938	0,746	74,6	1964	0,838	83,8	1994	112,165	11216,5
1939	0,779	77,9	1965	0,843	84,3	1995	148,170	14817,0
1940	1,105	110,5	1966	0,845	84,5	1996	205,364	20536,4
1941	-	-	1967	0,840	84,0	1997	523,062	52306,2
1942	-	-	1968	0,862	86,2	1998	826,438	82643,8
1943	-	-	1969	0,879	87,9	1999	1191,724	119172,4
1944	9,347	934,7	1970	0,880	88,0	2000	1731,575	173157,5
1945	-	-	1971	0,864	86,4	2001	2330,700	233070,0
1946	-	-	1972	0,864	86,4	2002	2857,438	285743,8
1947	6241,065	624106,5	1973	0,874	87,4	2003	3311,771	331177,1
15.08. 1947	The second great monetary reform 1:20000		1974	0,890	89,0	2004	3705,872	370587,2
1947	0,312	31,2	1975	0,908	90,8	2005	4043,106	404310,6
1948	-	-	1976	0,919	91,9	2005	Redenomination 0,404	1:10000 40,4
1949	-	-	1977	0,922	92,2	2006	4311,568	431156,8
1950	-	-	1978	0,943	94,3	2007	4521,542	452154,2
1951	-	-	1979	0,967	96,7	2008	4874,226	487422,6
1952	0,624	62,4	1980	1,064	106,4	2009	5145,233	514523,3
1953	0,657	65,7	1981	1,110	111,0	2010	5452,403	545240,3
			1982	1,307	130,7	2011	5770,824	577082,4
			1983	1,360	136,0	2012	5960,000	596000,0

Sources for annexes 2 and 3:

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APPENDIX 4

Debt dynamics in Romania in relation to exports, gross national product and gross domestic product between 1914 and 2012

Year	Debt DT *	Year	Debt DT *	Year	Debt DEI**	Year	Debt DEI**	Year	Debt DEI**	Year	Debt DEI**	Year	Debt DGT***
1914	383,0	1930	379,8	1971	0,1	1984	20,0	1997	27,3	2010	69,6	2000	33,9
1915	301,5	1931	503,7	1972	0,3	1985	14,7	1998	24,0	2011	69,3	2001	32,8
1916 1919	No data	1932	No data	1973	0,8	1986	13,5	1999	25,3	2012	78,9	2002	33,5
1920	323,3	1933	693,9	1974	0,8	1987	11,4	2000	29,9			2003	30,0
1921	245,8	1934	149,2	1975	1,0	1988	4,9	2001	31,2	Year	Debt DGT***	2004	29,9
1922	132,8	1935	635,1	1976	2,3	1989	2,0	2002	36,3	1992	11,1	2005	22,2
1923	118,5	1936	523,8	1977	3,0	1990	3,0	2003	38,0	1993	13,1	2006	19,8
1924	93,7	1937	360,6	1978	3,2	1991	7,5	2004	39,0	1994	16,4	2007	21,3
1925	89,9	1938	538,3	1979	10,2	1992	16,7	2005	39,2	1995	16,3	2008	29,9
1926	66,7	1939 1940	No data	1980	21,4	1993	16,2	2006	44,0	1996	21,7	2009	35,5
1927	69,1	1941	237,8	1981	19,1	1994	18,6	2007	50,4	1997	27,9	2010	37,7
1928	95,6	1942	179,3	1982	18,2	1995	19,3	2008	49,1	1998	27,5	2011	37,8
1929	331,6	1933	693,9	1983	19,1	1996	23,9	2009	72,5	1999	30,3	2012	38,7

Sursa: Camen Reinhart, Kenneth Rogoff, (2010), *From Financial Crash to Debt Crisis*, NBER Working Paper 15795, March 2010. *American Economic Review*. Available on-line at: http://www.reinhartandrogoff.com/data/browse-by-topic/topics/9/la_care_se_adauga_Eurostat_pentru_2011_si_2012.

*Note: The total debt (i.e. domestic plus foreign debt) as a percentage of export = $(DT / X) \times 100$

**Note: Total external debt (public and private) as a percentage of GNP = $(TED / GDP) \times 100$

***Note: Total government debt (internal and external debt) as a percentage of GDP = $(TGD / GDP) \times 100$ (TGD between 1992 and 2005 represents only the public sector in international assessments).

The references which formed the internationally comparable database for most countries described in detail by the authors in the paper are the following:

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