The Golden Mean, the Arab Spring and a 10-step analysis of American economic history

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The Golden Mean, The Arab Spring And a 10-Step Analysis of American Economic History

By Scott A. Albers* and Andrew L. Albers**

Abstract: *The Long-Wave theories of Nikolai Kondratiev and others claim to find mathematic waves in economic and other social data which are at present in dispute. Currently the theory is considered outside the scope of mainstream economics under several rationales.*

Despite the lack of mainstream acceptance, we make a strong case for the existence of long waves in the Real GNP of the United States with a 56 year cycle. Our analysis bypasses many of the issues cited by Long-Wave theory critics and in fact clarifies the mathematical structure of the theory.[1]

JEL classification: B41, B5, C01, C02, C50, C63, E00, E01, E10, E19, E30, N00, N01, N11, Z10, Z13

Keywords: Real GNP, Golden Mean, Fibonacci Series, Arab Spring, Phi, Long Wave, Long Cycle, Kondratiev Wave, Economic Forecasting, Economic Model, Global Financial Crisis, Constitutional Law, American Economic History, Revolution, Consolidation, GNP Spiral, Okun's Law, "The Great Moderation"

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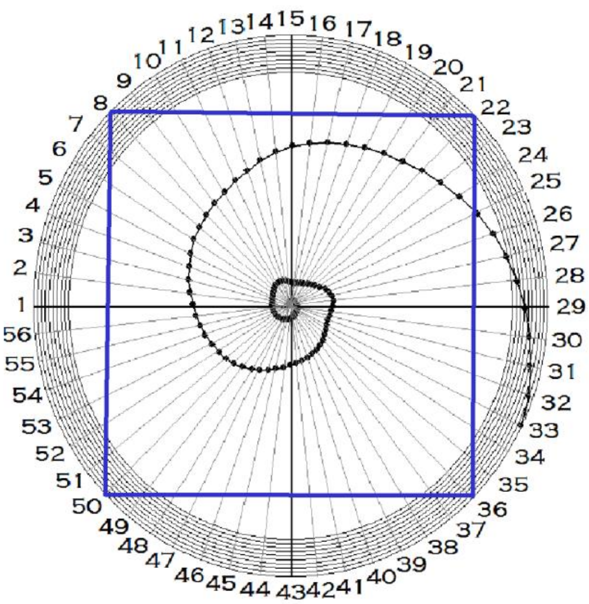
The cyclical model which we propose for U. S. Real GNP, 1869-present, is as follows. It will be referred to herein as "the GNP Spiral."[2]

	Date	Date	Date	Date	Date	Date
14	1762	1818	1874	1930	1986	
13	1761	1817	1873	1929	1985	
12	1760	1816	1872	1928	1984	
11	1769	1815	1871	1927	1983	
10	1768	1814	1870	1926	1982	
9	1767	1813	1869	1925	1981	
8	1766	1812	1868	1924	1980	2036
7	1765	1811	1867	1923	1979	2035
6	1764	1810	1866	1922	1978	2034
5	1763	1809	1865	1921	1977	2033
4	1762	1808	1864	1920	1976	2032
3	1761	1807	1863	1919	1975	2031
2	1760	1806	1862	1918	1974	2030
1	1759	1805	1861	1917	1973	2029
56		1804	1860	1916	1972	2028
55		1803	1859	1915	1971	2027
54		1802	1858	1914	1970	2026
53		1801	1857	1913	1969	2025
52		1800	1856	1912	1968	2024
51		1799	1855	1911	1967	2023
50		1798	1854	1910	1966	2022
49		1797	1853	1909	1965	2021
48		1796	1852	1908	1964	2020
47		1795	1851	1907	1963	2019
46		1794	1850	1906	1962	2018
45		1793	1849	1905	1961	2017
44		1792	1848	1904	1960	2016
43		1791	1847	1903	1959	2015



	Date	Date	Date	Date	Date
15	1763	1819	1875	1931	1987
16	1764	1820	1876	1932	1988
17	1765	1821	1877	1933	1989
18	1766	1822	1878	1934	1990
19	1767	1823	1879	1935	1991
20	1768	1824	1880	1936	1992
21	1769	1825	1881	1937	1993
22	1770	1826	1882	1938	1994
23	1771	1827	1883	1939	1995
24	1772	1828	1884	1940	1996
25	1773	1829	1885	1941	1997
26	1774	1830	1886	1942	1998
27	1775	1831	1887	1943	1999
28	1776	1832	1888	1944	2000
29	1777	1833	1889	1945	2001
30	1778	1834	1890	1946	2002
31	1779	1835	1891	1947	2003
32	1780	1856	1892	1948	2004
33	1781	1837	1893	1949	2005
34	1782	1838	1894	1950	2006
35	1783	1839	1895	1951	2007
36	1784	1840	1896	1952	2008
37	1785	1841	1897	1953	2009
38	1786	1842	1898	1954	2010
39	1787	1843	1899	1955	2011
40	1788	1844	1900	1956	2012
41	1789	1845	1901	1957	2013
42	1790	1846	1902	1958	2014

In Steps 1 through 8 of this paper we show that when a 56-year cycle is taken as the basis for the circuit above, "the Golden Mean" – an ancient and well-known mathematic constant – is found in the un-averaged data for United States Real GNP, 1869-2009, to an accuracy of 3.4 parts in 10,000. Under certain assumptions this proximity to the Golden Mean increases even to 5.3 parts in 100,000.[3]

In Step 9 we correlate this cycle to legal changes in the Federal Constitution, demonstrating the importance of this analysis beyond the realm of economics.

In Step 10 we speculate possible correlations of this analysis as taken at a global scale towards an interpretation of the recent meltdown of the world's economy and current events in the Middle East.

This model may be supportive of long-wave theories, including those of Nikolai Kondratiev. We present these here briefly, and return to them at the close of this paper.

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[2] Appendices 1 (abbreviated), 4, 5 and 7 are included at the close of this paper. A full data set of appendices may be found at http://www.middle-east-studies.net/?p=22639.

[3] In Footnote 16 at the Conclusion of Step 8 the possibility is raised of an association between the GNP Spiral analysis herein and Okun's Law. Okun's Law is "one of the most reliable empirical regularities in macroeconomics." (Tobin, 1983) This "rule of thumb" holds that a ratio of roughly 3:1 holds for increases in the rate of GNP growth and decreases in the rate of unemployment respectively. When the "steady state" rate of growth under Okun's Law (Knotek, 2007) is taken as a growth rate under the assumptions of our analysis herein, a result is obtained which is in proximity to the Golden Mean of 2.7 parts in 100,000, closer than any variable discussed in this paper.

The Problem

In his 1925 work *The Major Economic Cycles* Nikolai Kondratiev postulated a long-term wave running throughout the economic histories of various western countries of approximately 50 to 60 years. (Kondratiev, 1925) Joseph Schumpeter's 1939 work *Business Cycles* acknowledged Kondratiev's significance to economics. (Schumpeter, 1939) Nevertheless the importance of these cycles has faced a variety of complaints. (see e.g. Rothbard, 1984)

The academic search for evidence of "long waves" running through the economic history of various nation-states is long standing (Goldstein, 1988) and a central topic of heterodox economics. Indeed a 52-53 year cycle has been described in very extensive detail underlying the global meltdown (Korotayev and Tsirel, 2010) and incorporated into the study of the current revolutionary movements in the Middle East. (Tausch, 2011)

Our approach is quite different from the long-wave analysis of these authors[4] whose works are replete with data from different countries and time periods as presented under a variety of mathematic assumptions.[5] In this paper we shall deal only with the United States, only with data published by the United States government, and only with the mathematical elegance of such a cycle.[6] In this paper we will suggest that indeed a 56-year cycle may be involved in the "Arab Spring" in a fashion heretofore unexplored.[7]

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[4] Kondratiev's work originated in the dangerous political context of prior socialist discoveries (Van Gelderen (1913), DeWolff (1924) and Kautsky (1917)) and communist theories (e.g. Marx, Lenin, Trotsky, Stalin) as to the evils of capitalism and the nature of its inevitable demise. (Goldstein, 1988:30-31) Kondratiev's suggestion that democratic capitalism might avoid such demise brought to him the censure of Stalin and death in a Siberian prison camp.

Orthodox economics, on the other hand, maintains an enormous breadth of opinion as to whether considerations of political policy must, or must not, be a part of doctrinal discipline. This paper concludes that there is much in Kondratiev's work which is directly applicable to the economic history of the United States, but does so without reference to Marx, et al.

[5] Orthodox economics rejects "long waves" as a fallacy and concentrates rather on econometric measurements of other variables, i.e. the stochastic vs. deterministic effects governing the creation of real GNP itself. (See e.g. Nelson and Plosser, 1982) The distinction has been important for mainstream economics. (See e.g. Cochrane, 1988: "The distinction between a random walk … and a trend-stationary series … is extreme. Long-range forecasts of a random walk move one for one with shocks at each date, while long-range forecasts of a trend-stationary series do not change at all. There are two related ways to think about a series that lies between these two extremes.")

The ultimate significance of this inquiry however may be questionable. (Sowell, 1992: "The fact that postwar GNP series cannot distinguish between a time trend and a unit root model has important implications for theoretical models of the economy. Attention should be given to models where both the policy and theoretical implications of interest are not sensitive to the model of the trend. Ideally we would like a model which implies the same results if the trend is modeled as either a time trend or a unit root. Until such models are developed, further attention should be given to new statistical techniques which focus on discovering the long-run behavior of time series.")

[6] A famous quote attributed to Johannes Kepler (1571-1630) regarding the Golden Mean is the following: "Geometry has two great treasures; one is the Theorem of Pythagoras; the other, the division of a line into extreme and mean ratio. The first we may compare to a measure of gold, the second we may name a precious jewel." (Livio, 2002:62)

[7] The model presented herein is not the outcome of research of Kondratieff Waves nor of mainstream economics, but rather of philosophy, specifically that of Parmenides and Zeno of Elea, circa 550 b.c. (See, e.g., Rucker, 1983:84-88.)

A Proposed Solution:
A Brief Introduction To "The Golden Mean"

The Golden Mean, sometimes referred to as "the Golden Ratio" or "the Golden Section," was defined in 300 b.c. by Euclid of Alexandria, as follows:

> A straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the lesser.[8]

If line segment AC is to AB in the same proportion as line segment AB is to BC, then line segment AC has been divided into its extreme and mean ratios at point B. If line segment AB is set equal to 1, and if line segment AC is in a Golden Ratio relationship with AB, then AC will equal approximately 1.6180339887… (see e.g. Livio, 2002:3-4), a numeric constant generally referred to by the Greek letter phi in lower case φ. Algebraically, this may be expressed as:

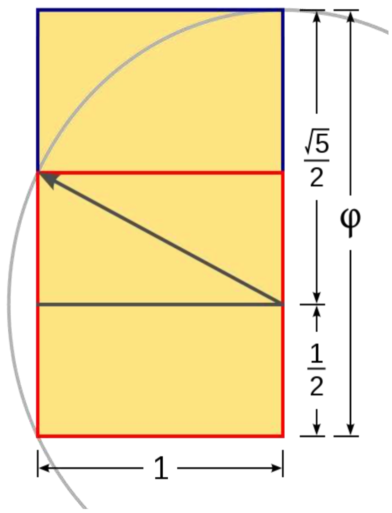
$$\frac{a+b}{a} = \frac{a}{b} \equiv \varphi \,.$$

As discovered by Johannes Kepler in 1611, if the Fibonacci series is taken as a set of ratios, these ratios oscillate around the constant 1.6180… as follows (Livio, 2002:101):

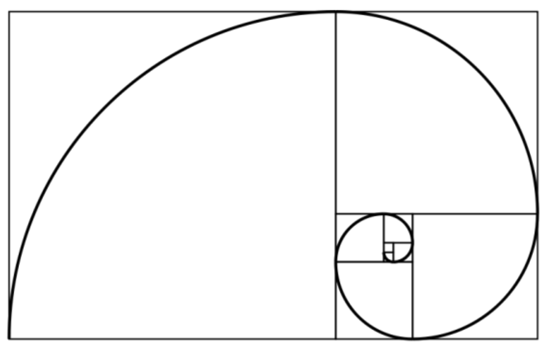
1.	1/1	1.000000
2.	2/1	2.000000
3.	3/2	1.500000
4.	5/3	1.666666
5.	8/5	1.600000
6.	13/8	1.625000
7.	21/13	1.615385
8.	34/21	1.619048
9.	55/34	1.617647
10. .	89/55	1.618182
11.	144/89	1.617978
12.	233/144	1.618056
13.	377/233	1.618026
14.	610/377	1.618037
15.	987/610	1.618033

[8] Euclid of Alexandria, Elements, Book VI, Definition 3, circa 300 b.c..

Geometrically, the proportion of 1: φ may be created by the following construction.



A spiral may be obtained from this construction as follows. This spiral and its relationship to the economy of the United States will be the focus of this paper.[9]



When this model is complete this spiral pattern of U. S. Real GNP will demonstrate a proximity to phi of 5.3 parts in 100,000 using un-averaged data taken directly from official sources of the United States Government, i.e. slightly closer than the 10th Fibonacci fraction 89/55. This model is presented in the following ten steps.

[9] At least one reference – albeit atavistic – may be cited in support of a similarity between the large number of designs found in Nature which incorporate the Golden Mean (the galactic spiral, the Chambered Nautilus, seed pods of various plants, aspects of DNA, etc.) and the almost biologic dynamism of the GNP Spiral presented herein. (See e.g. Kahn, 1961:425) "(I)t … seems likely that Stalin's caution (regarding antagonism toward the United States) did not stem from fear of the atomic bomb as a decisive weapon. What alarmed him about the United States was Detroit – not (the Strategic Air Command)! He appears to have felt very strongly that no sensible government tangles with a nation with a GNP of $300 billion a year. Luckily we had both assets – the bomb and the GNP – so that any difference between U.S. and Soviet calculations was not crucial."

Model

As we consider the Gross National Product of the United States over time, our sources are limited. The United States Department of Commerce has published one set of numbers based upon 1958 prices running between 1869 through 1970. The St. Louis Federal Reserve has published a different sequence of numbers based upon 2005 prices extending between 1947 through to the present day.

If two sets of data propose to measure over time exactly the same thing, then the underlying unity of the thing measured should remain in tact despite any number of possible series which might be used to convey the object under discussion. For example if one set of observations describes a series as: "5, 10, 15, 25, 35, 55, 65, 85, 95, etc.", and a second set of observations describes exactly the same series as: "3, 6, 9, 15, 21, 33, 39, 51, 57, etc.", we could make these series equivalent by multiplying the first series by 3/5, or multiplying the second series by 5/3. Or we could divide the first series by 5, and divide the second by 3, and discover that both series simply state using different numbers the pattern of the first 9 prime numbers, i.e. 1, 2, 3, 5, 7, 11, 13, 17, 19 etc. If we have but fragmentary parts of these series, we might use these "splicing multiples" of 3/5 or 5/3 to use one series to fill in the blanks of the entire series. In this way we may approach an understanding of the underlying nature of the thing described by our observations.

Splicing multiples are quite necessary when considering two different series each of which proposes to calculate U.S. Real GNP over different periods of time. To "splice" or to "graft" these two sets together is necessary if an extended series running from 1869 to the present day is to be obtained. There does not exist at the present time such a series published by the United States Government. Consequently our first step in the analysis is to construct such a series as the foundation of this approach. [10]

[10] See e.g. Cochrane, 1988:902. "The presence of a splice in 1947 also does not drive the result. Every long series of GNP data contains at least one splice. The wide surveys used to construct later data are simply not available for earlier periods, so some projection using a restricted set of industries is unavoidable."

1. Appendix 1. Make a list of figures for U. S. Real GNP, in constant terms, beginning in 1869. Figures for U. S. Real GNP 1869-1970 may be found the book *Historical Statistics of the United States: Colonial Times to 1970, Part 1*, published by the United States Department of Commerce. Series F 1-5 presents "Gross National Product" for the United States between the years 1869-1970 according to 1958 prices. The years 1869-1878, and 1879-1888 are given with decade averages of 23.1 billion and 42.4 billion dollars respectively.

Figures for U. S. Real GNP 1947-present are collected by the St. Louis Federal Reserve.[11]

The best multiple which might be used to splice these two series together is the average of the last ten years of overlap, i.e. 1961 – 1970. This multiple is 5.962552.

Appendix 1 considers three possible multiples with which to splice these two series of U.S. Real GNP figures together. The first possible splicing multiple is 5.881696, the average of all 23 multiples between 1947-1970 given in Appendix 1 column 6. These are the years during which these two separate series overlap. This number is problematic in that there is a clear drift from 1947 through 1970 toward higher multiples. Figures from 1947-1960 range from 5.646318 (1953) to 5.977644 (1958) and average at 5.8239423. Figures from 1961-1970 range a bit higher, i.e. from 5.907649 (1962) to 6.071220 (1965).

A second possible splicing multiple is 5.962552, the average of the final ten years of overlap, i.e. between 1961-1970. This multiple is the one used to splice these series in this paper as it is nearer in time to the eventual cutoff between the series and includes only multiples found in the later and more recent multiples.

A third possible splicing multiple is 6.0, which simply rounds to the nearest whole number the previous splicing multiple. This number is problematic because only two of the 23 multiples to consider – 1961 at 6.033387 and 1965 at 6.071220 – are at 6.0 or above.

The data given in Appendix 1 figures an extended series for U.S. Real GNP in constant terms between 1868 through 2009 for each of these multiples. (See Appendix 1, Columns 8, 9 and 10) However for the purposes of this paper only the mid-range splicing multiple, 5.962552, will be used for calculations.

[11] These figures are available at: http://research.stlouisfed.org/fred2/series/GNPC96

2. Appendix 2. Create ratios of U. S. Real GNP by taking as the numerator one year's real GNP and dividing it by the figure of an earlier year. (For example, 2009/2008 (one year spread); 2009/2007 (two year spread); etc.)

In the effort to estimate the proximity of any given set of ratios to phi, four terms will be used. These are:

The "Mid-Range." The mid-range is the mid-point lying between the high and low ratios in the sample, i.e. the average of the highest and lowest numbers in the set: "(H + L) / 2".

The "Average" or "Arithmetic Mean." The sample mean is the sum of all the observations divided by the number of observations:

The "Median." The median is that number for which half the data is larger than it, and half the data is smaller. It is also called the 50th percentile. If the data has an odd number of members, the median will be the number in the center of these members; if an even number of members, the median will be the mid-point between the two numbers closest to the center.

The "Median Average." The Median Average is the mid-point between the Median and the Average (Arithmetic Mean). It is figured as: "(Median + Average) / 2" and is the approximation used throughout this paper as the best figure to evaluate a set of ratios' proximity to phi.

3. Appendix 3. Determine which set of these ratios is most closely associated with “The Golden Mean,” 1.6180… by:

a) indicating the spread between years which generates the ratio (presented below in the “# of years” first column),

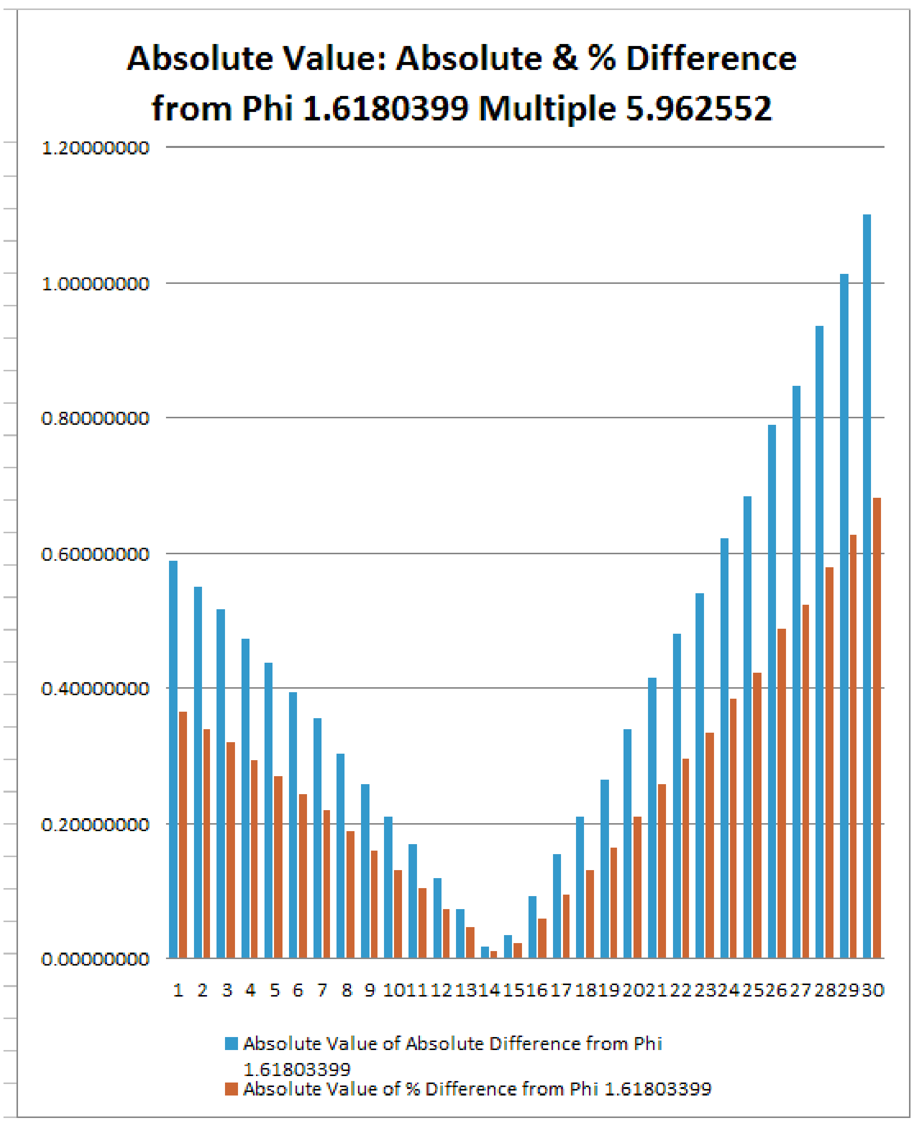
b) setting forth the Median Average for all ratios generated for any given spread of years (second column below),

c) figuring the “absolute difference” and the “percentage difference” of these different Median Averages from phi (3rd and 4th columns below), and finally

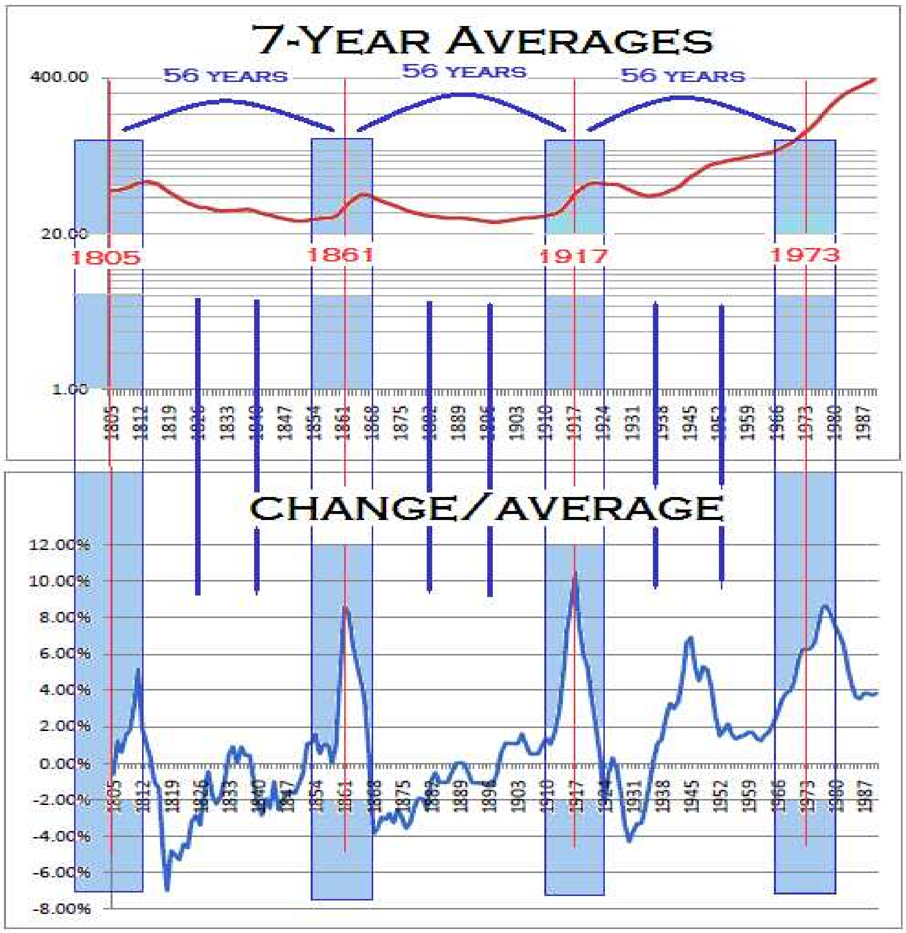
d) stating these differences as absolute values (5th and 6th columns below).

This data is summarized in the bar graph to the right of this data. This graph demonstrates that Median Average ratios generated by a 14-year spread between years are closest to phi.

# of Years	Median Aveage	Absolute Difference from Phi 1.61803399	% Difference from Phi 1.61803399	Absolute Value of Absolute Difference from Phi 1.61803399	Absolute Value of % Difference from Phi 1.61803399
1	1.03086043	0.58717356	36.2893216%	0.58717356	36.2893216%
2	1.06996068	0.54807331	33.8727936%	0.54807331	33.8727936%
3	1.10353672	0.51449727	31.7976802%	0.51449727	31.7976802%
4	1.14504076	0.47299323	29.2325895%	0.47299323	29.2325895%
5	1.18247232	0.43556167	26.9191915%	0.43556167	26.9191915%
6	1.22633118	0.39170281	24.2085649%	0.39170281	24.2085649%
7	1.26388505	0.35414894	21.8876084%	0.35414894	21.8876084%
8	1.31520833	0.30282566	18.7156551%	0.30282566	18.7156551%
9	1.36070905	0.25732494	15.9035558%	0.25732494	15.9035558%
10	1.40916235	0.20887164	12.9089775%	0.20887164	12.9089775%
11	1.44965664	0.16837735	10.4062924%	0.16837735	10.4062924%
12	1.50019982	0.11783417	7.2825524%	0.11783417	7.2825524%
13	1.54501537	0.07301862	4.5127988%	0.07301862	4.5127988%
14	1.60189961	0.01613438	0.9971593%	0.01613438	0.9971593%
15	1.65125029	-0.03321630	-2.0528801%	0.03321630	2.0528801%
16	1.70936280	-0.09132881	-5.6444307%	0.09132881	5.6444307%
17	1.77052591	-0.15249192	-9.4245191%	0.15249192	9.4245191%
18	1.82742627	-0.20939228	-12.9411549%	0.20939228	12.9411549%
19	1.88097935	-0.26294536	-16.2509171%	0.26294536	16.2509171%
20	1.95675154	-0.33871755	-20.9338960%	0.33871755	20.9338960%
21	2.03196341	-0.41392942	-25.5822452%	0.41392942	25.5822452%
22	2.09620235	-0.47816836	-29.5524302%	0.47816836	29.5524302%
23	2.15690921	-0.53887522	-33.3043204%	0.53887522	33.3043204%
24	2.23755840	-0.61952441	-38.2887142%	0.61952441	38.2887142%
25	2.30123214	-0.68319815	-42.2239677%	0.68319815	42.2239677%
26	2.40625778	-0.78822379	-48.7149093%	0.78822379	48.7149093%
27	2.46439399	-0.84636000	-52.3079247%	0.84636000	52.3079247%
28	2.55145856	-0.93342457	-57.6888107%	0.93342457	57.6888107%
29	2.62813943	-1.01010544	-62.4279492%	1.01010544	62.4279492%
30	2.71795717	-1.09992318	-67.9789908%	1.09992318	67.9789908%


Absolute Value: Absolute & % Difference from Phi 1.6180399 Multiple 5.962552
1.20000000
1.00000000
0.80000000
0.60000000
0.40000000
0.20000000
0.00000000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Absolute Value of Absolute Difference from Phi 1.61803399
Absolute Value of % Difference from Phi 1.61803399

4. Appendix 4. Examine the price indexes for the United States between 1800 and 1994. These are stated below (1) in 7-year running averages (red line, top graph, semi-logarithmic scale), and (2) the change between years in the seven-year average as divided by the average itself (blue line, bottom graph). The lower graph permits us to see the increasingly large inflationary price index values of later years (post-1966) as placed in a more consistent relationship with the preceding values of the series.



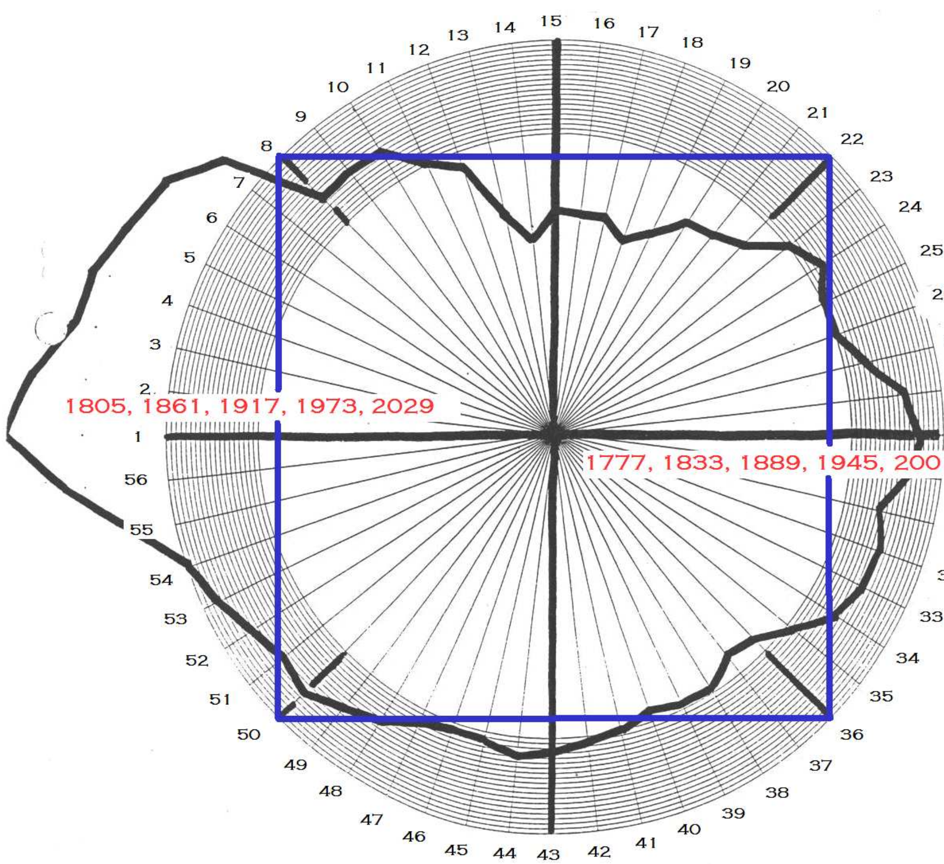
Note in the above that the 56 year period (14 x 4 = 56) between peaks at 1861 through 1917 suggests the possibility that similar periods of time might connect other peak points of inflation. If a 14-year span (blue rectangles above) is drawn around the years 1805, 1861, 1917 and 1973 (each of which is separated by periods of 56 years), virtually all inflationary peaks are contained in a single model. Minimal inflation has occurred since 1993 and will not affect this analysis in any way.[12]

12 It should be mentioned that a 14-year span may have support and importance beyond the technique used herein. See Korotayev and Tsirel, 2010:10. "As is easily seen in Fig. 2A in both spectra one can detect distinctly the Kondratieff cycle (its period equals approximately 52-53 years), however, the cycle with a period of 13-15 years is detected even more distinctly."

5. Appendix 5. Place all change/average inflation (lower graph above) along a 56-year circuit shown below. In the following diagram 9 o'clock represents the midpoint of the cumulative average of all inflation along a 56 year cycle as contained within the blue rectangles above. (This is marked as "Year One" in Appendix 5.) 3 o'clock represents the midpoint of the cumulative average of all inflation rates 28 years later. (Line 29 in Appendix 5)

The circumference of each circle represents a positive increase in the cumulative change/average figure of 1/2 percent (for example, a change/average cumulative amount of 1805 + 1861 + 1917 + 1973 lying directly at 9 o'clock). Points found within the interior of the smallest circumference represent negative figures by a comparable amount.

The blue square below represents the four 14-year segments of time set forth in Step 4. The blue rectangles (previously given) are represented by the vertical left line segment (below). Taken together 4 x 14 periods of time create the 56 year circuit of time of this model. Note that the Great Depression of 1929-1940 is part of the deep indentation between axis 8 and 22, i.e. at the top horizontal of the blue square and interior to the smallest radii.



LINES IN BLUE REPRESENT 14 YEAR PERIODS OF TIME

NUMBERS IN BLACK REPRESENT SEPARATE AND DISTINCT RAYS ALONG THE 56-YEAR CIRCUIT

YEARS IN RED INDICATE DATES LYING ALONG THE SAME AXIS

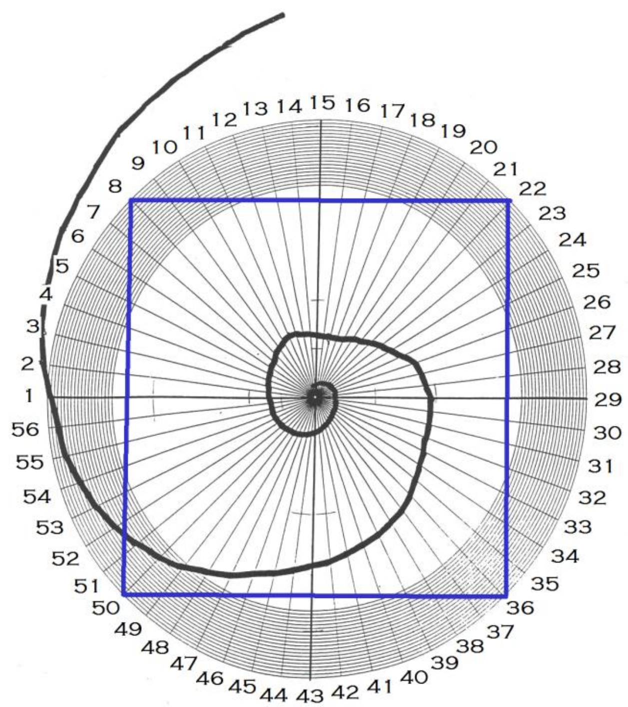
EACH RADII OF CIRCUMFERENCE REPRESENTS A POSITIVE INCREASE OF 1/2 PERCENT IN THE CUMULATIVE INFLATION RATE FOR THAT AXIS

6. Combine this 56-year circuit with our figures for U. S. Real GNP.

If we take 7-year running averages of the U. S. Real GNP (Steps One and Two), we can see that 14 sets of ratios, all lying in crosses at 90 degrees or 180 degrees from one another, are presented.

In order to explore this more thoroughly, let us take the real GNP figures averaged for seven year periods running between 1869-1987 (See Appendix 1, Column 12) over this 56-year circuit, and create the spiral below. The center of the spiral, beginning at axis 9 = 1869, represents the real Gross National Product for that year of 23.10 billion dollars in 1958 prices. The Gross National Product – as stated in seven-year running averages – for subsequent years in real terms are given along each axis respectively, with each circle of circumference representing ten billion dollars of real GNP in 1958 prices.

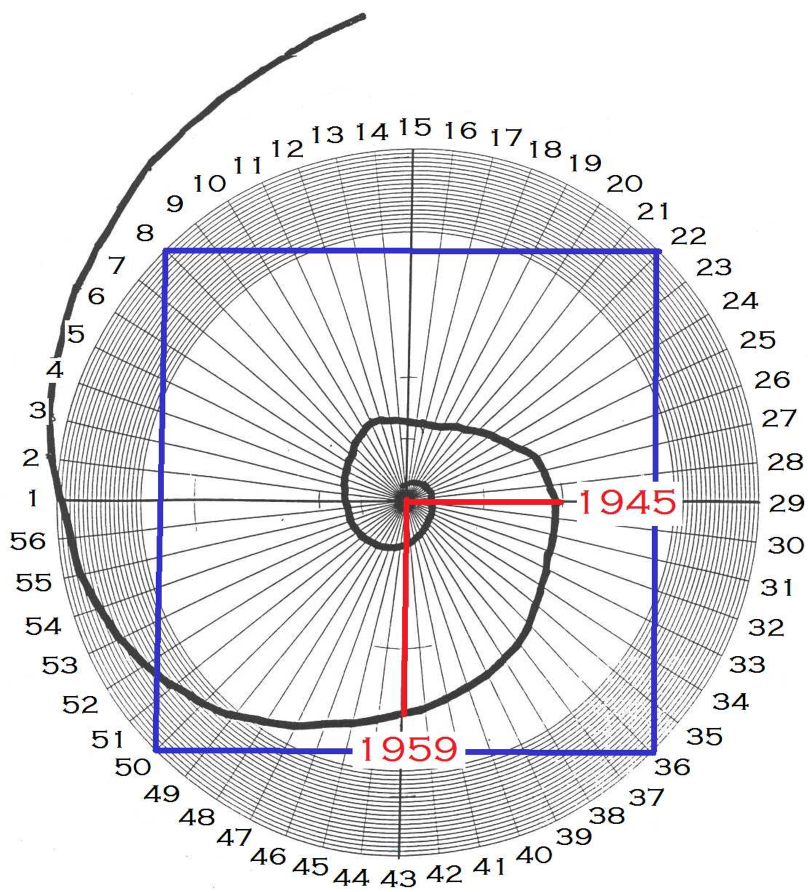
	Date	Date	Date	Date	Date	Date
14	1762	1818	1874	1930	1986	
13	1761	1817	1873	1929	1985	
12	1760	1816	1872	1928	1984	
11	1769	1815	1871	1927	1983	
10	1768	1814	1870	1926	1982	
9	1767	1813	1869	1925	1981	
8	1766	1812	1868	1924	1980	2036
7	1765	1811	1867	1923	1979	2035
6	1764	1810	1866	1922	1978	2034
5	1763	1809	1865	1921	1977	2033
4	1762	1808	1864	1920	1976	2032
3	1761	1807	1863	1919	1975	2031
2	1760	1806	1862	1918	1974	2030
1	1759	1805	1861	1917	1973	2029
56		1804	1860	1916	1972	2028
55		1803	1859	1915	1971	2027
54		1802	1858	1914	1970	2026
53		1801	1857	1913	1969	2025
52		1800	1856	1912	1968	2024
51		1799	1855	1911	1967	2023
50		1798	1854	1910	1966	2022
49		1797	1853	1909	1965	2021
48		1796	1852	1908	1964	2020
47		1795	1851	1907	1963	2019
46		1794	1850	1906	1962	2018
45		1793	1849	1905	1961	2017
44		1792	1848	1904	1960	2016
43		1791	1847	1903	1959	2015



	Date	Date	Date	Date	Date
15	1763	1819	1875	1931	1987
16	1764	1820	1876	1932	1988
17	1765	1821	1877	1933	1989
18	1766	1822	1878	1934	1990
19	1767	1823	1879	1935	1991
20	1768	1824	1880	1936	1992
21	1769	1825	1881	1937	1993
22	1770	1826	1882	1938	1994
23	1771	1827	1883	1939	1995
24	1772	1828	1884	1940	1996
25	1773	1829	1885	1941	1997
26	1774	1830	1886	1942	1998
27	1775	1831	1887	1943	1999
28	1776	1832	1888	1944	2000
29	1777	1833	1889	1945	2001
30	1778	1834	1890	1946	2002
31	1779	1835	1891	1947	2003
32	1780	1856	1892	1948	2004
33	1781	1837	1893	1949	2005
34	1782	1838	1894	1950	2006
35	1783	1839	1895	1951	2007
36	1784	1840	1896	1952	2008
37	1785	1841	1897	1953	2009
38	1786	1842	1898	1954	2010
39	1787	1843	1899	1955	2011
40	1788	1844	1900	1956	2012
41	1789	1845	1901	1957	2013
42	1790	1846	1902	1958	2014

If we divide the set of points along the spiral by "crosses" of 90 degrees each, we envision the relationship between points of the spiral in a mathematic relationship with each other, whereby the productive activity of the United States may be measured over the long-term.[13] For example, let us look at the figures in Appendix 1, Column 12. Referring to the appropriate date, the year 1959 (axis 43, 6 o'clock) has a larger Gross National Product than does the year 1945 (axis 29, 3 o'clock), 14 years previous. This relationship between years 90 degrees apart from one another is proportional to the productivity of these years (numbers given are unrounded) or:

1959 (axis 43) =	476.6000 =	1.4520
1945 (axis 29) =	328.2286	



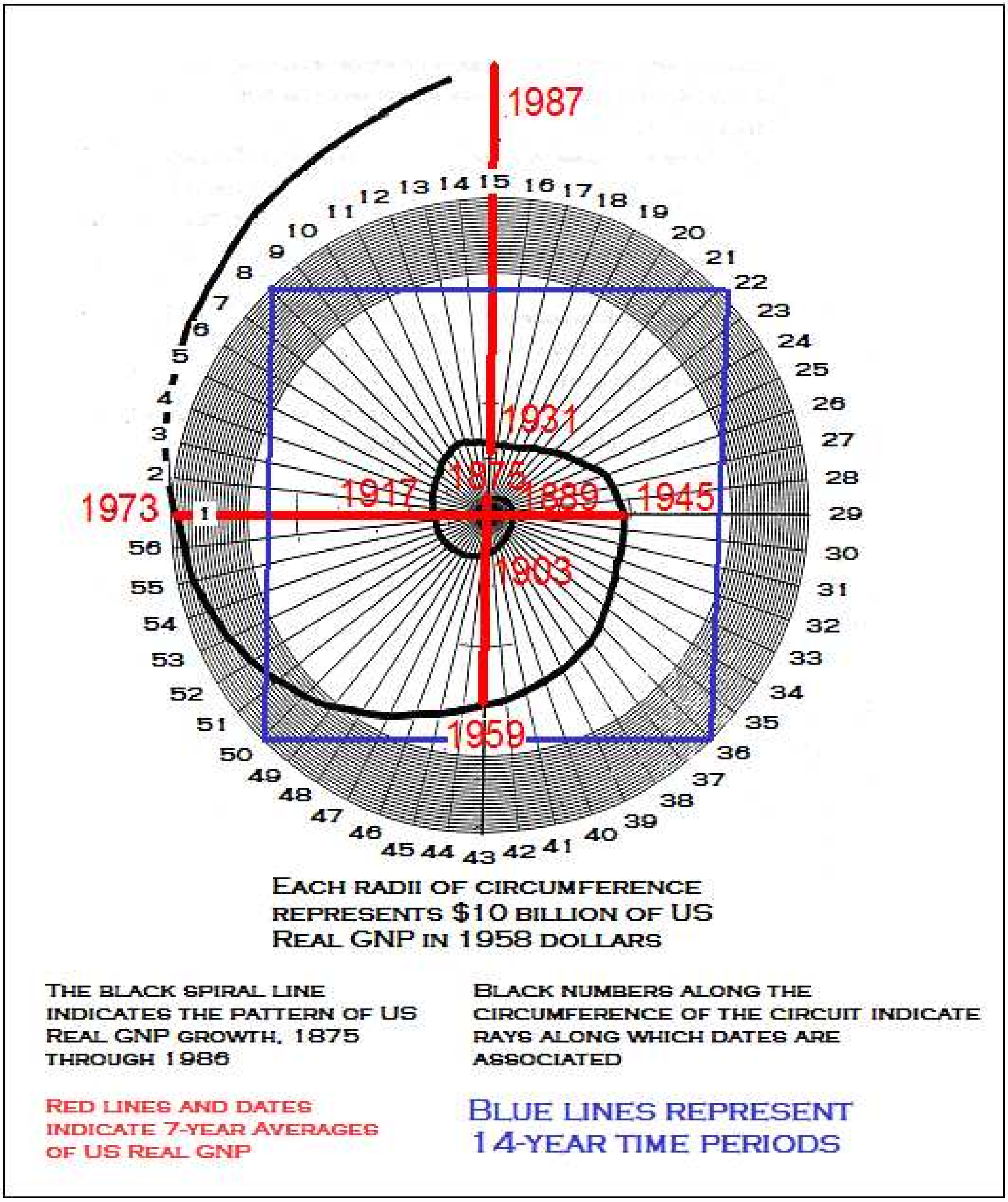
13 The approach here is similar in intent to that of econophysics. See e.g. McCauley, 2009:9. "Econophysics, simply stated, means following the example of physics in observing and modeling markets."

The entire series of numbers following this pattern of vertical and horizontal axes (axes 1, 15, 29, and 43, 9 o'clock, 12 o'clock, 3 o'clock and 6 o'clock, respectively) would be as follows:

1889= 49.2143	1903= 90.4857	1917= 136.8429	1931= 169.6143
1875= 25.8571	1889= 49.2143	1903= 90.4857	1917= 136.8429
ratio: 1.9033	1.8386	1.5123	1.2394

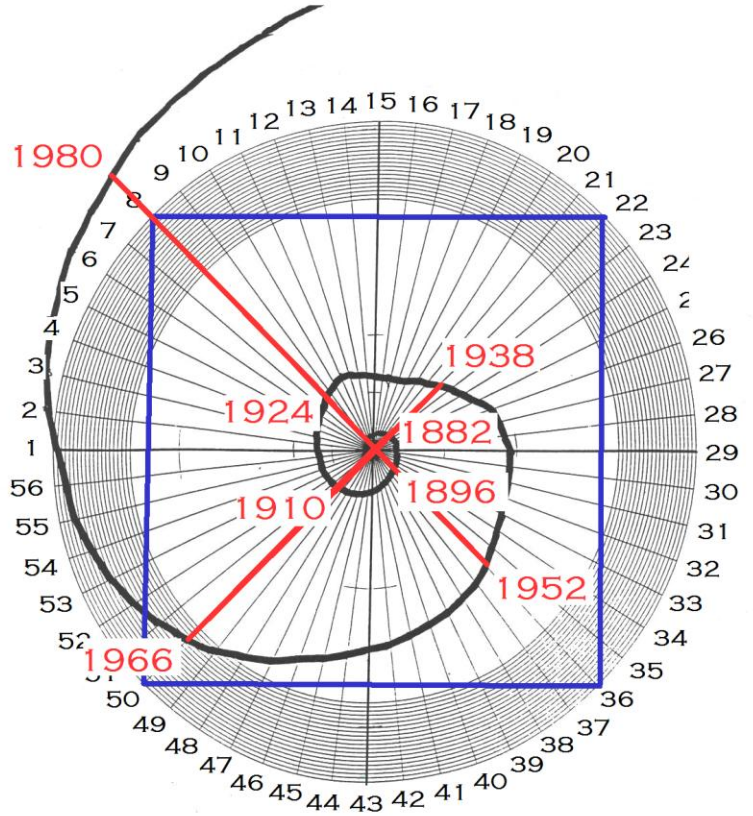
1945= 328.2286	1959= 476.6000	1973=808.6766	1987=1,284.0653
1931= 169.6143	1945= 328.2286	1959=476.64	1973= 808.6766
ratio: 1.9351	1.4520	1.6967	1.5878

2001=1,943.5784
1987=1,224.0653
ratio: 1.5066



Note that each year begins as a numerator of a fraction and then becomes the denominator of the subsequent fraction. The average ratio for the period 1869-2001 along this cross is 1.6302.

We might consider as well the diagonals of the square which has been proposed.



EACH RADII OF CIRCUMFERENCE REPRESENTS $10 BILLION OF US REAL GNP IN 1958 DOLLARS

BLACK NUMBERS ALONG THE CIRCUMFERENCE OF THE CIRCUIT INDICATE RAYS ALONG WHICH DATES ARE ASSOCIATED

THE BLACK SPIRAL LINE INDICATES THE PATTERN OF US REAL GNP GROWTH, 1875 THROUGH 1986 IN RUNNING 7-YEAR AVERAGES

RED DATES INDICATE PARTICULAR MOMENTS OF US REAL GNP

BLUE LINES REPRESENT 14-YEAR TIME PERIODS

These ratios for the period 1868-1987 are:

1896 = 63.9714	1910 = 118.7286	1924 = 166.6429	1938 = 208.4143
1882 = 42.4000	1896 = 63.9714	1910 = 118.7286	1924 = 166.6429
ratio: 1.5087	1.8559	1.4035	1.2506
1952 = 387.9571	1966 = 645.0571	1980 = 997.9522	1994=1512.9302
1938 = 208.4143	1952 = 387.9571	1966 = 645.0571	1980=997.9522
ratio: 1.8614	1.6626	1.5470	1.5160

The average of these ratios of diagonals is 1.5786.

Taking the average ratio of the *horizontal/vertical* axes (1.6302), combined with the average of the *diagonal* axes (1.5786), yields the average of these two figures as 1.6044, or:

$$\frac{1.5786 + 1.6302}{2} = 1.6044$$

This number is merely 0.0136 less than the constant phi = 1.618033988... This number indicates that the average of our horizontal/vertical cross, as coupled with the diagonal cross, represent a number which is less than one percent less (.0040) than phi.

$$\frac{1.6044}{1.6180} = 0.9915$$

This discovery leads us to the following step in our analysis.

7. Appendix 6. Place the 14-year ratios of *un-averaged* U. S. Real GNP (Steps One and Two) for all available figures for GNP, 1869 to the present, into rows and columns as follows. We have added the amount 23.10 for the year 1868 in order to make the table complete, although the Historical Abstract of the United States does not include this year's amount. The un-averaged figures for the diagonal cross above is found in Row 1, and the horizontal / vertical cross above is found in Row 8.

Appendix 6.2
14 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000	1938	192.9000	1952	395.1000
	14	**Est. ***	23.1000	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000	1938	192.9000
	Ratio		1.835498		1.445755		1.959217		1.378018		1.1655589		2.0482115
2	Year	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000	1939	209.4000	1953	412.8000
	14	1869	23.1000	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000	1939	209.4000
	Ratio		1.835498		1.582547		1.836066		1.456169		1.1672241		1.9713467
3	Year	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000	1940	227.2000	1954	407.0000
	14	1870	23.1000	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000	1940	227.2000
	Ratio		1.835498		1.617925		1.897959		1.459293		1.1957895		1.7913732
4	Year	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000	1941	263.7000	1955	438.0000
	14	1871	23.1000	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000	1941	263.7000
	Ratio		1.835498		1.764151		1.756684		1.445205		1.3886256		1.6609784
5	Year	1886	42.4000	1900	76.9000	1914	125.6000	1928	190.9000	1942	297.8000	1956	446.1000
	14	1872	23.1000	1886	42.4000	1900	76.9000	1914	125.6000	1928	190.9000	1942	297.8000
	Ratio		1.835498		1.813679		1.63329		1.519904		1.559979		1.4979852
6	Year	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000	1943	337.1000	1957	452.5000
	14	1873	23.1000	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000	1943	337.1000
	Ratio		1.835498		2.021226		1.452742		1.635341		1.6556974		1.3423317
7	Year	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000	1944	361.3000	1958	447.3000
	14	1874	23.1000	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000	1944	361.3000
	Ratio		1.835498		2.040094		1.553757		1.365327		1.9689373		1.2380293
8	Year	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000	1945	355.2000	1959	475.9000
	14	1875	23.1000	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000	1945	355.2000
	Ratio		2.125541		1.849287		1.488987		1.252219		2.0980508		1.3398086
9	Year	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000	1946	312.6000	1960	487.7000
	14	1876	23.1000	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000	1946	312.6000
	Ratio		2.281385		1.702087		1.692308		0.949934		2.1678225		1.5601408
10	Year	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000	1947	309.9000	1961	497.2000
	14	1877	23.1000	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000	1947	309.9000
	Ratio		2.385281		1.747731		1.520249		0.96653		2.190106		1.6043885
11	Year	1892	60.4000	1906	107.5000	1920	140.0000	1934	154.3000	1948	323.7000	1962	529.5000
	14	1878	42.4000	1892	60.4000	1906	107.5000	1920	140.0000	1934	154.3000	1948	323.7000
	Ratio		1.424528		1.779801		1.302326		1.102143		2.0978613		1.6357739
12	Year	1893	57.5000	1907	109.2000	1921	127.8000	1935	169.5000	1949	324.1000	1963	551.0000
	14	1879	42.4000	1893	57.5000	1907	109.2000	1921	127.8000	1935	169.5000	1949	324.1000
	Ratio		1.356132		1.89913		1.17033		1.326291		1.9120944		1.7000926
13	Year	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000	1950	355.3000	1964	581.1000
	14	1880	42.4000	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000	1950	355.3000
	Ratio		1.318396		1.792487		1.477046		1.304054		1.8409326		1.6355193
14	Year	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000	1951	383.4000	1965	617.8000
	14	1881	42.4000	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000	1951	383.4000
	Ratio		1.476415		1.865815		1.420377		1.224834		1.886811		1.6113719
	Ratio of Columns		1.8012		1.7801		1.5830		1.3132		1.7354		1.6170

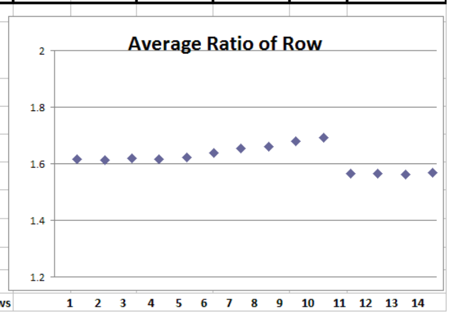
" **Est. *** " The data for 1868, 23.10, has been taken from the estimate given in the Historical Abstract for the years 1869 - 1877. This enables Column 1, 1882 - 1895, to be added into the graph with the minumum of difficulty in figuring averages for both rows and columns. This amount is repeated throughout the period, 1869 - 1877, and appears to represent a reasonable estimate for the Real GNP of 1868.

	Average	MEDIAN	MEDIAN-AVG.
Circle Analysis	1.619446	1.617735	1.618590
Square Analysis	1.619126	1.617114	1.618120

Appendix 6.2

14 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

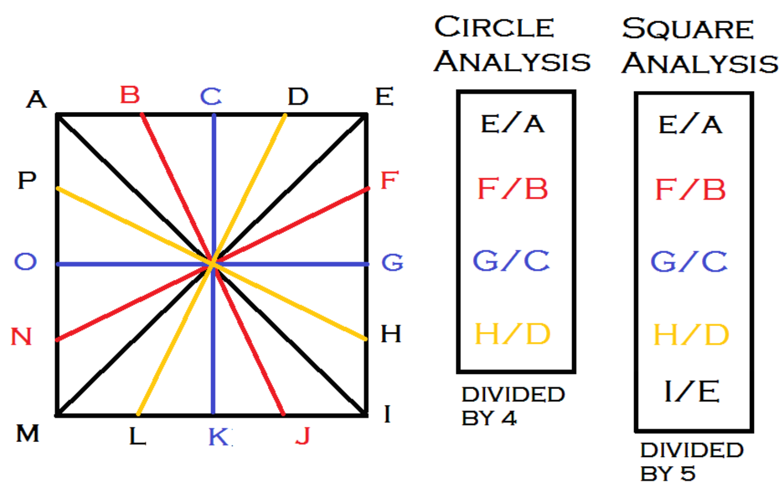
YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Average Ratio of Row	AVERAGE	MEDIAN	MEDIAN-AVG.
1966	658.1000	1980	996.8309	1994	1514.3943	2008	2198.6295				
1952	395.1000	1966	658.1000	1980	996.8309	1994	1514.3943				
	1.665654		1.5147104		1.5192088			1.6146			
1967	675.2000	1981	1010.8394	1995	1546.7308	2009	2208.7984				
1953	412.8000	1967	675.2000	1981	1010.8394	1995	1546.7308				
	1.635659		1.4970963		1.5301449			1.6124			
1968	706.6000	1982	995.1411	1996	1615.0033						
1954	407.0000	1968	706.6000	1982	995.1411						
	1.736118		1.4083514		1.6228888			1.6184			
1969	725.6000	1983	1072.5727	1997	1681.8760						
1955	438.0000	1969	725.6000	1983	1072.5727						
	1.656621		1.4781873		1.5680765			1.6171			
1970	722.5000	1984	1129.4464	1998	1764.5370						
1956	446.1000	1970	722.5000	1984	1129.4464						
	1.619592		1.5632476		1.5623026			1.6228			
1971	751.2051	1985	1174.0716	1999	1854.0672						
1957	452.5000	1971	751.2051	1985	1174.0716						
	1.660122		1.5629175		1.5791773			1.6383			
1972	803.4814	1986	1203.2684	2000	1911.3209						
1958	447.3000	1972	803.4814	1986	1203.2684						
	1.796292		1.4975685		1.588441			1.6538			
1973	839.4182	1987	1256.1826	2001	1925.1794						
1959	475.9000	1973	839.4182	1987	1256.1826						
	1.763854		1.496492		1.5325633			1.6608			
1974	821.7401	1988	1303.1774	2002	1957.1959						
1960	487.7000	1974	821.7401	1988	1303.1774						
	1.684929		1.5858754		1.5018645			1.6807			
1975	843.0778	1989	1340.0434	2003	2036.0677						
1961	497.2000	1975	843.0778	1989	1340.0434						
	1.695651		1.5894659		1.5194043			1.6910	1.61945	1.61773	1.61859
1976	879.3138	1990	1351.3622	2004	2093.6810						
1962	529.5000	1976	879.3138	1990	1351.3622						
	1.660649		1.5368372		1.5493115			1.5655			
1977	922.6690	1991	1360.3512	2005	2151.0247						
1963	551.0000	1977	922.6690	1991	1360.3512						
	1.674535		1.4743653		1.5812275			1.5660			
1978	985.8821	1992	1418.0149	2006	2201.9891						
1964	581.1000	1978	985.8821	1992	1418.0149						
	1.696579		1.438321		1.5528674			1.5618			
1979	1001.7304	1993	1454.1409	2007	2272.2615						
1965	617.8000	1979	1001.7304	1993	1454.1409						
	1.621448		1.451629		1.5626144			1.5690			
								Total Ratio of Columns			
	1.6834		1.5068		1.5550			1.6194			



	Average	Median	Median Avg.
Circle Analysis	1.619446	1.617735	1.618590
Square Analysis	1.619126	1.617114	1.618120

The "circle" analysis above takes the ratio of each row and averages it once, i.e. the 14 ratios given in the "Average Ratio of Rows" column to the right of the data as divided by 14. This is consistent with the definition of a circle i.e. that set of points lying in a plane equidistant from a single point.

A "square" analysis creates a similar average of rows, but counts the diagonal cross (first row) twice and then divides by 15, rather than 14. This is consistent with the notion of a square, i.e. a quadrilateral figure of line segments AB, BC, CD, DA in which all sides are both equal in length and at right angles from each other. Because each letter represents both the end of one line of fractions (ratios given by years in a 14-year spread) and the beginning of the next, the diagonal cross must be counted twice to consider the line segment fully.



Reviewing Appendix Six it appears that the Real GNP of the United States does indeed have a profound and dramatic connection to phi, "The Golden Mean."

The summarized results are as follows:

Splicing Multiple		Proximity to 1.61803399	
		Absolute	Percentage
5.881696			
Median Average (Circle)	1.620932	+ 0.0028980	+ 0.179%
Median Average (Square)	1.620483	+ 0.0024490	+ 0.151%
5.962552			
Median Average (Circle)	1.618590	+ 0.0005560	+ 0.034%
Median Average (Square)	1.618120	+ 0.0000860	+ 0.0053%
6.00			
Median Average (Circle)	1.617527	- 0.0005069	- 0.031%
Median Average (Square)	1.617370	- 0.0006639	- 0.041%

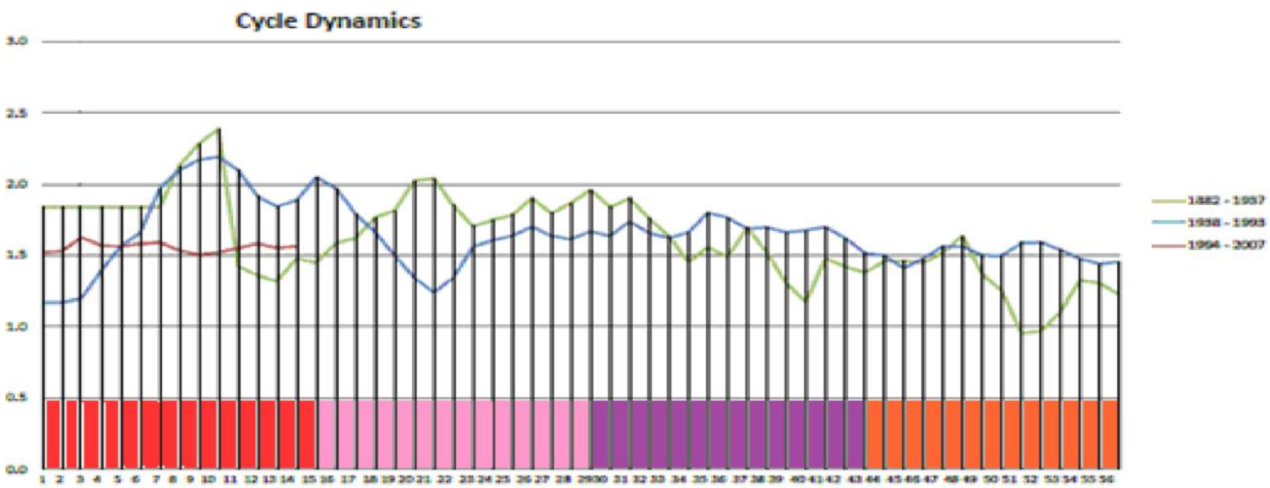
Taking the two splicing multiples above which do not include multiples prior to 1961 – 5.962552 and 6.0 – each Median Average figured is greater than the Golden Mean by no more than 3.4 parts per ten thousand (+0.034%) and less than the Golden Mean by no more than 4.1 parts per ten thousand (- 0.041%).

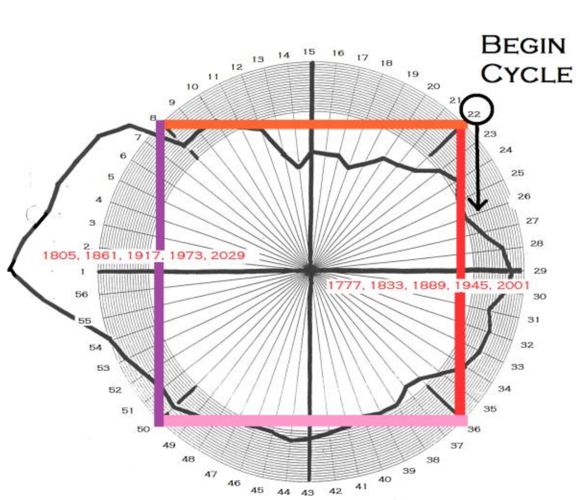
Using our second mid-range multiple (5.962552) we obtain a Median Average under a circle analysis of slightly more than the Golden Mean by 3.4 parts per 10,000 (+0.034%) and under a square analysis at very slightly more than the Golden Mean by merely 5.3 parts per 100,000 (+0.0053%). *This is done with un-averaged data from the United States Government which is altered only by splicing one series for U. S. Real GNP to the next.*

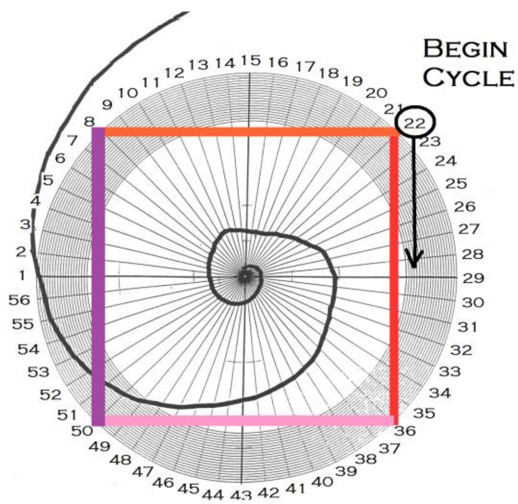
It would appear with great strength that the Golden Mean has a definite and perhaps central place in the economic development of the United States as derived directly from the numeric data available for U. S. Real GNP.

8. Appendix 7. Evaluate how proximity to the Golden Mean is increased through this analysis.

It may be instructive to consider the impact of the Golden Mean throughout an entire 56-year cycle. The movement around the spiral is indicated by color-coding each of the four 14-year segments along the spiral: red = right vertical, pink= lower horizontal, purple = left vertical, orange = upper horizontal.







The chart above presents the ratios of the former spread sheets as these occur in their time series. The first year is the ratio given for 1882 (upper-right corner of the GNP Spiral and first ratio of the spread sheet, row 1, column 1) and proceeds across the Cycle Dynamics chart with the green line to 1937. The cycle then repeats and the first year of the x-axis is now 1938 (again taken from the upper right corner of the GNP Spiral and row 1, column 5 of the spread sheet); it proceeds across the Cycle Dynamics chart with the blue line to 1993. The cycle then begins again and the first year along the x-axis is now 1994 (again upper right corner of the GNP Spiral and the first row, 9th and final column of the spreadsheet); this proceeds across the Cycle Dynamics chart with the red line along a partial circuit, ending at 2007.

In Step 3 we found that a 14-year spread of years led to ratios which best approximated the Golden Mean. The Median Average of all ratios so generated brought us to an absolute proximity to phi of 0.01613438 and a percentage proximity to phi of 0.9971593%. Comparing these to the spread sheet given in Step 7 we have come significantly closer to the Golden Mean.

Splicing Multiple		Proximity to	
5.962552		1.61803399	
		Absolute	Percentage
Previous			
(Step 3, all ratios, 14-year spread)			
	1.60189961	- 0.01613438	0.9971593%
Median Average (Circle)	1.618590	+ 0.0005560	+ 0.034%
Median Average (Square)	1.618120	+ 0.0000860	+ 0.0053%

Simply by placing these numbers in a 14-row spread sheet, we have an increased proximity to phi of 30 fold, and even 200 fold. From this mass of numbers the central ratio of the Golden Mean emerges. How does this take place?

To answer this question let us expand the spread sheet in Appendix 6 and investigate the averages which emerge in Appendix 7.

APPENDIX 7

14 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

		1		2		3		4		5		6	
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000	1938	192.9000	1952	395.1000
	14	**Est. ***	23.1000	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000	1938	192.9000
	Ratio		1.8354978		1.4457547		1.959217		1.3780183		1.1655589		2.0482115
2	Year	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000	1939	209.4000	1953	412.8000
	14	1869	23.1000	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000	1939	209.4000
	Ratio		1.8354978		1.5825472		1.8360656		1.4561688		1.1672241		1.9713467
3	Year	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000	1940	227.2000	1954	407.0000
	14	1870	23.1000	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000	1940	227.2000
	Ratio		1.8354978		1.6179245		1.8979592		1.4592934		1.1957895		1.7913732
4	Year	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000	1941	263.7000	1955	438.0000
	14	1871	23.1000	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000	1941	263.7000
	Ratio		1.8354978		1.7641509		1.7566845		1.4452055		1.3886256		1.6609784
5	Year	1886	42.4000	1900	76.9000	1914	125.6000	1928	190.9000	1942	297.8000	1956	446.1000
	14	1872	23.1000	1886	42.4000	1900	76.9000	1914	125.6000	1928	190.9000	1942	297.8000
	Ratio		1.8354978		1.8136792		1.63329		1.5199045		1.559979		1.4979852
6	Year	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000	1943	337.1000	1957	452.5000
	14	1873	23.1000	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000	1943	337.1000
	Ratio		1.8354978		2.0212264		1.4527421		1.6353414		1.6556974		1.3423317
7	Year	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000	1944	361.3000	1958	447.3000
	14	1874	23.1000	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000	1944	361.3000
	Ratio		1.8354978		2.0400943		1.5537572		1.3653274		1.9689373		1.2380293
8	Year	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000	1945	355.2000	1959	475.9000
	14	1875	23.1000	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000	1945	355.2000
	Ratio		2.1255411		1.8492872		1.4889868		1.2522189		2.0980508		1.3398086
9	Year	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000	1946	312.6000	1960	487.7000
	14	1876	23.1000	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000	1946	312.6000
	Ratio		2.2813853		1.7020873		1.6923077		0.9499341		2.1678225		1.5601408
10	Year	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000	1947	309.9000	1961	497.2000
	14	1877	23.1000	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000	1947	309.9000
	Ratio		2.3852814		1.7477314		1.5202492		0.9665301		2.190106		1.6043885
11	Year	1892	60.4000	1906	107.5000	1920	140.0000	1934	154.3000	1948	323.7000	1962	529.5000
	14	1878	42.4000	1892	60.4000	1906	107.5000	1920	140.0000	1934	154.3000	1948	323.7000
	Ratio		1.4245283		1.7798013		1.3023256		1.1021429		2.0978613		1.6357739
12	Year	1893	57.5000	1907	109.2000	1921	127.8000	1935	169.5000	1949	324.1000	1963	551.0000
	14	1879	42.4000	1893	57.5000	1907	109.2000	1921	127.8000	1935	169.5000	1949	324.1000
	Ratio		1.3561321		1.8991304		1.1703297		1.3262911		1.9120944		1.7000926
13	Year	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000	1950	355.3000	1964	581.1000
	14	1880	42.4000	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000	1950	355.3000
	Ratio		1.3183962		1.7924866		1.4770459		1.3040541		1.8409326		1.6355193
14	Year	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000	1951	383.4000	1965	617.8000
	14	1881	42.4000	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000	1951	383.4000
	Ratio		1.4764151		1.8658147		1.4203767		1.2248342		1.886811		1.6113719
A	Maximum Ratio of Column		2.385281		2.040094		1.959217		1.635341		2.190106		2.048212
B	Minimum Ratio of Column		1.318396		1.445755		1.170330		0.949934		1.165559		1.238029
C	Spread		1.066885		0.594340		0.788887		0.685407		1.024547		0.810182
D	Mid-Range Ratio of Column		1.851839		1.742925		1.564773		1.292638		1.677832		1.643120
E	Median Ratio of Column		1.835498		1.779801		1.520249		1.326291		1.840933		1.635519
F	Average Ratio of Column		1.801155		1.780123		1.582953		1.313233		1.735392		1.616954

Est. * The data for 1868, 23.10, has been taken from the estimate given in the Historical Abstract for the years 1869 - 1877. This enables Column 1, 1882 - 1895, to be added into the graph with the minimum of difficulty in figuring averages for both rows and columns. This amount is repeated throughout the period, 1869 - 1877, and appears to represent a reasonable estimate for the Real GNP of 1868

APPENDIX 7

14 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

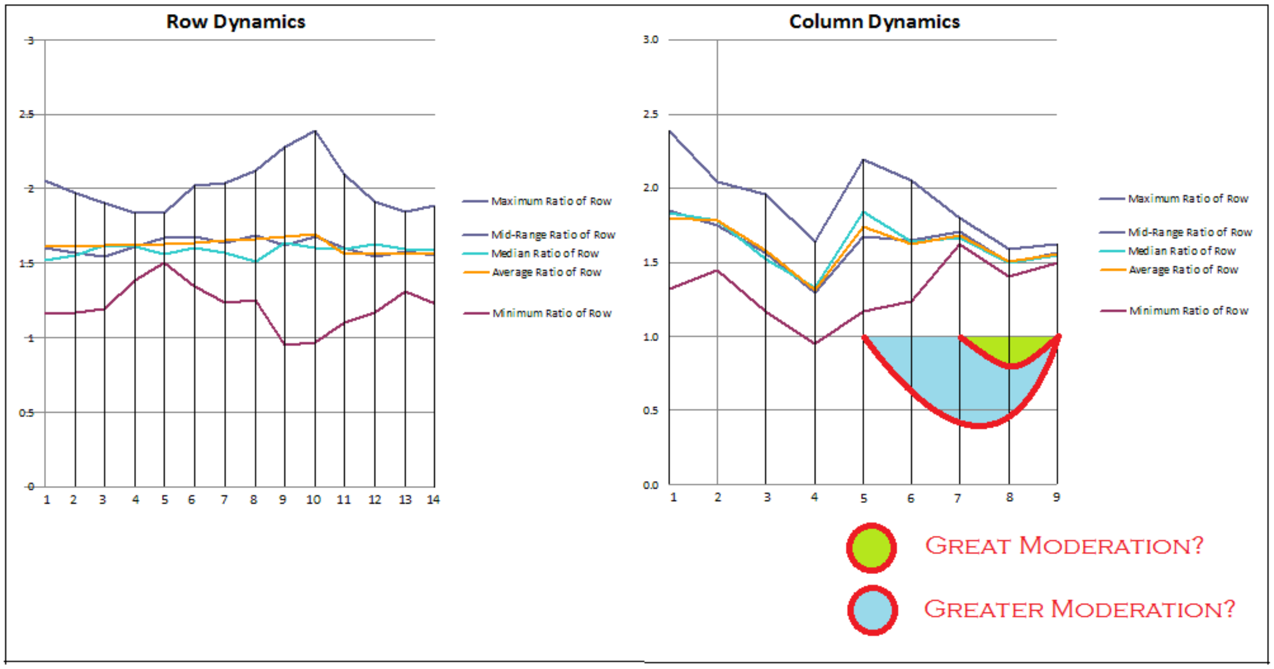
7		8		9		10		A	B	C	D	E	F
YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row
1966	658.1000	1980	996.8309	1994	1514.3943	2008	2198.6295						
1952	395.1000	1966	658.1000	1980	996.8309	1994	1514.3943						
	1.66565426		1.51471038		1.51920882			2.048212	1.165559	0.882653	1.606885	1.516960	1.614648
1967	675.2000	1981	1010.8394	1995	1546.7308	2009	2208.7984						
1953	412.8000	1967	675.2000	1981	1010.8394	1995	1546.7308						
	1.63565891		1.49709627		1.53014495			1.971347	1.167224	0.804123	1.569285	1.556346	1.612417
1968	706.6000	1982	995.1411	1996	1615.0033								
1954	407.0000	1968	706.6000	1982	995.1411								
	1.73611794		1.4083514		1.62288875			1.897959	1.195789	0.702170	1.546874	1.620407	1.618355
1969	725.6000	1983	1072.5727	1997	1681.8760								
1955	438.0000	1969	725.6000	1983	1072.5727								
	1.656621		1.47818729		1.56807646			1.835498	1.388626	0.446872	1.612062	1.612349	1.617114
1970	722.5000	1984	1129.4464	1998	1764.5370								
1956	446.1000	1970	722.5000	1984	1129.4464								
	1.61959202		1.56324761		1.56230256			1.835498	1.497985	0.337513	1.666742	1.562775	1.622831
1971	751.2051	1985	1174.0716	1999	1854.0672								
1957	452.5000	1971	751.2051	1985	1174.0716								
	1.66012177		1.5629175		1.57917728			2.021226	1.342332	0.678895	1.681779	1.607259	1.638339
1972	803.4814	1986	1203.2684	2000	1911.3209								
1958	447.3000	1972	803.4814	1986	1203.2684								
	1.79629197		1.49756846		1.58844103			2.040094	1.238029	0.802065	1.639062	1.571099	1.653772
1973	839.4182	1987	1256.1826	2001	1925.1794								
1959	475.9000	1973	839.4182	1987	1256.1826								
	1.76385417		1.49649198		1.53256334			2.125541	1.252219	0.873322	1.688880	1.514528	1.660756
1974	821.7401	1988	1303.1774	2002	1957.1959								
1960	487.7000	1974	821.7401	1988	1303.1774								
	1.68492946		1.58587539		1.50186452			2.281385	0.949934	1.331451	1.615660	1.635402	1.680705
1975	843.0778	1989	1340.0434	2003	2036.0677								
1961	497.2000	1975	843.0778	1989	1340.0434								
	1.69565125		1.58946588		1.5194043			2.385281	0.966530	1.418751	1.675906	1.596927	1.690979
1976	879.3138	1990	1351.3622	2004	2093.6810								
1962	529.5000	1976	879.3138	1990	1351.3622								
	1.66064929		1.53683725		1.5493115			2.097861	1.102143	0.995718	1.600002	1.592543	1.565470
1977	922.6690	1991	1360.3512	2005	2151.0247								
1963	551.0000	1977	922.6690	1991	1360.3512								
	1.67453539		1.47436535		1.58122748			1.912094	1.170330	0.741765	1.541212	1.627881	1.566022
1978	985.8821	1992	1418.0149	2006	2201.9891								
1964	581.1000	1978	985.8821	1992	1418.0149								
	1.69657907		1.43832097		1.55286739			1.840933	1.304054	0.536879	1.572493	1.594193	1.561800
1979	1001.7304	1993	1454.1409	2007	2272.2615								
1965	617.8000	1979	1001.7304	1993	1454.1409								
	1.62144772		1.451629		1.56261439			1.886811	1.224834	0.661977	1.555823	1.586993	1.569035
	1.796292		1.589466		1.622889								
	1.619592		1.408351		1.501865								
	0.176700		0.181114		0.121024								
	1.707942		1.498909		1.562377								
	1.665654		1.497096		1.552867								
	1.683407		1.506790		1.555007								

Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Mid-Range + Average/2	Median + Average/2
1.690979	1.561800	1.626389	1.617735	1.619446	1.622918	1.618590

Max. of F - Columns	Min. of F - Columns	Mid-Range of F - Columns	Median of F - Columns	Avg. of F - Columns	Mid-Range + Average/2	Median + Average/2
1.801155	1.313233	1.557194	1.616954	1.619446	1.588320	1.618200

	Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Mid-Range + Average/2	Median + Average/2
Circle Analysis	1.690979	1.561800	1.626389	1.617735	1.619446	1.622918	1.618590
Square Analysis	1.690979	1.561800	1.626389	1.617114	1.619126	1.622758	1.618120

In step 3 we had but a single median and a single average for all ratios generated by a 14-year spread. This resulted in the Median Average given by Appendix 2 of 1.60189961 for the entire set. Taking the dynamics presented in the rows and columns as a graph, we have:



For both rows and columns when a high is reached it is immediately balanced by a low as determined from the approximate midpoint of the Golden Mean.

In addition, as time has passed the American economy has steadily narrowed its focus to precisely this same single point.[14]

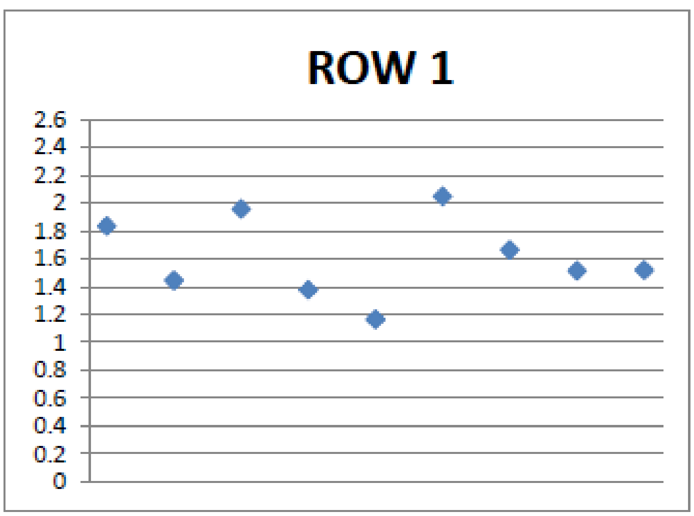
[14] The last two columns of the Column Dynamic graphic represent a time period stretching from the end of Column 7 (1979) to end of Column 9 (2007). During this period of time the economic volatility of previous years markedly narrowed. Although hailed at the time as "The Great Moderation" and a possible sign of progress in economic understanding (e.g. Bernanke, 2004), post-Global Financial Crisis this view has come under attack. (e.g. Chomsky, 2011) The same graphic demonstrates that a marked narrowing of volatility began two columns prior to 1979, i.e. beginning with the end of Column 5 (1951), named here "The Greater Moderation" by way of comparison. See *supra*, Step 10.

We may notice that the Median Average of the Columns is itself 1.618200. This number is greater than the Golden Mean by 9.8 parts in 100,000.

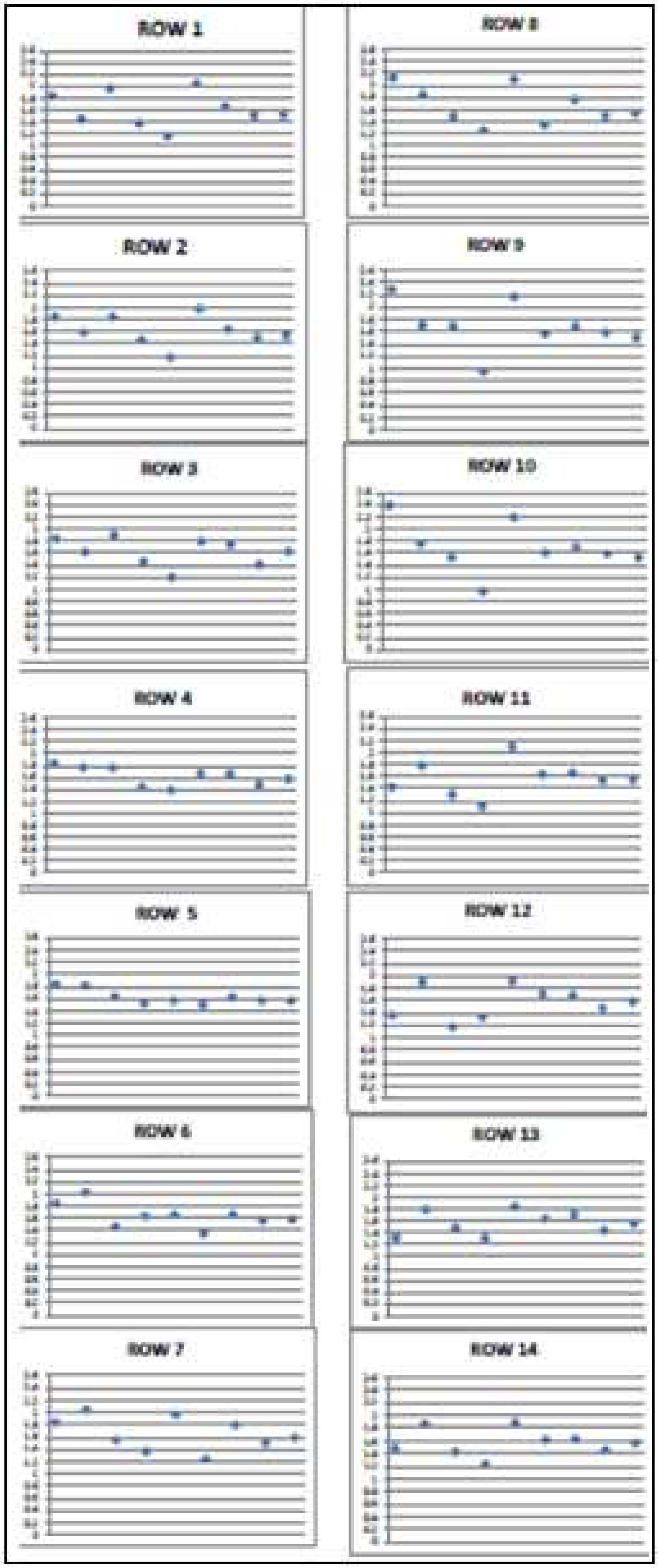
		Proximity to 1.61803399	
Splicing Multiple 5.962552			
		Absolute	Percentage
Rows:			
Median Average (Circle)	1.618590	+0.000556	+0.034%
Median Average (Square)	1.618120	+0.000086	+0.0053%
Columns			
Median Average	1.618200	+0.000167	+0.0098%

The above makes clear that the Golden Mean does not appear as a haphazard finding in a mass of data. Rather it is a consistent point, one which is central to the structure of the American economy. The collective power of these separate 14 sets of tensions propels a proximity to the Golden Mean which is greater than the simple average of the data itself.

The process of this "balancing" might be viewed by listing all ratios presented in row 1:



This wave-like process may be seen as frames in an animation, first from 1-7, then 8-14.



The sense here is of waves of water striving to obtain a set equilibrium. This suggests that a wave of relationships exist within the data wherein each row balances towards phi, not unlike water disturbed by waves eventually stabilizes at a fixed level.[15] As this combined set of Median Averages "works" upon the data, the result is an increased proximity to phi overall. [16]

We may now expand this model toward the consideration of recent and current events.

---

[15] To figure the annual increase implied by the GNP Spiral, we may use the formula for simple interest compounded annually…

$$FV = PV\ (1+r)^t$$

… ; state a present value (PV) of $1,000,000; a time period (t) of 14 years; and the future value (FV) as given below in proportion to the varying numbers derived in the GNP Spiral. These assumptions give us the following interest rates (r).

	Future Value		Interest rate
x= Circle Analysis:	$1,618,590	interest rate is:	3.4995226
x= Columns:	$1,618,200	interest rate is:	3.4977411
x= 89/55:	$1,618,181	interest rate is:	3.4976543
x= Square Analysis:	$1,618,120	interest rate is:	3.4973756
x= Golden Mean:	$1,618,033	interest rate is:	3.4969781

These "interest rates" are the annual "rates of growth" necessary to obtain the various proportions of the GNP Spiral over time.

[16] The above "rates of growth" may be contrasted with one of the central empirical regularities of mainstream economics, i.e. Okun's Law. This rule proposes a roughly 3:1 ratio between increases in real GNP and decreases in the rate of unemployment in the economy of the United States. A trend line may be devised for quarterly data between the second quarter of 1948 and the second quarter of 2007 which gives the slope of this relationship as:

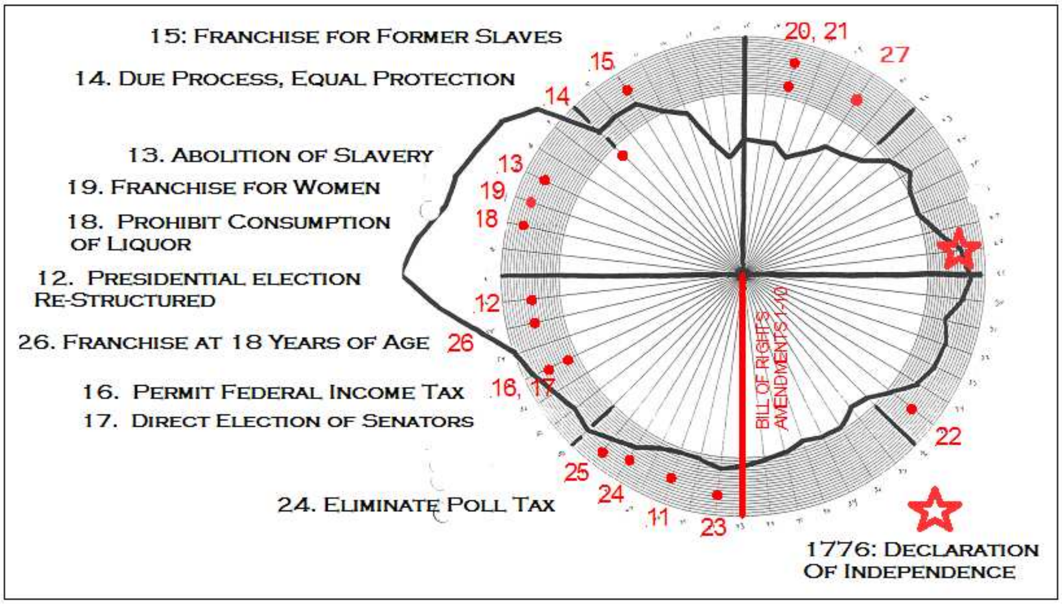
$$y = .23094 + -0.066036x$$

A "steady state" rate of economic growth may be figured for the x-intercept, i.e. that rate of growth which occurs when there is no change in the rate of employment. (y = 0). Using the above equation and trend line, this x-intercept is 3.4971853. (Knotek, 2007, with additional correspondence by the author). When this "steady state" rate of growth under Okun's Law is placed among the "rates of growth" calculated by the GNP Spiral, *the x-intercept generates a future value in proximity to the Golden Mean of 2.7/100,000 parts, closer than all other values.*

Analysis:	Future Value	Promixity to Phi	Rate:	Comparison to Okun's x-intercept at 3.4971853
Circle:	$1,618,590	1.00034424	3.4995226	1.000668337
Columns:	$1,618,200	1.00010321	3.4977411	1.000158927
89/55:	$1,618,181	1.00009146	3.4976543	1.000134108
Square:	$1,618,120	1.00005376	3.4973756	1.000054415
x-axis:	$1,618,078	1.00002781	3.4971853	1
Phi:	$1,618,033	1	3.4969781	0.999940752

9. The significance of this 56-year cycle may be extended beyond the realm of economics if we correlate the dates of political events with their respective axes in this circuit.

For example if we place on the various axes of the 56-year circuit the dates of the Amendments to the United States Constitution we have the following distribution of significant changes to the legal foundation of the United States. It is immediately apparent that a far greater number of amendments have been adopted toward the left hand side of the circuit than have been adopted during the right hand side.



Let us first discount the Bill of Rights as falling on the exact dividing line between the left and right sides of this circuit (enacted December 15, 1791). If we consider only the remaining amendments we may note that in addition to a numeric difference, a qualitative difference also exists between the right-hand and left-hand sides of the circuit. Falling within a ten-year span before and after "Year 1" (9 o'clock) are amendments:

(1) to give former slaves the franchise (Am. 15, axis 10=1870),
(2) to require "due process of law" and "equal protection" (Am 14, axis 8=1868),
(3) to abolish slavery (Am. 13, axis 5=1865),
(4) to permit women the franchise (Am. 19, axis 4=1920),
(5) to prohibit the consumption of liquor (Am. 18, axis 3=1919),
(6) to re-structure the election of Presidents and Vice-Presidents (Am. 12, axis 56= 1804),
(7) to permit 18 year old citizens the franchise (Am. 26, axis 54=1971),
(8) to permit the imposition of income taxes (Am. 16, axis 53=1913),
(9) to require the direct election of senators (Am. 17, axis 53= 1913), and
(10) to eliminate poll taxes as a requirement to voting (Am. 24, axis 48=1964).

Only two constitutional amendments fall within a ten year span of "Year 29," i.e. 3 o'clock. Amendment 22 restricts a president from serving more than 2 terms in office (axis 31=1951) and enshrines in law a tradition begun by George Washington 154 years earlier when in 1797 he refused to run for a third term in office. Amendment 27 prohibits laws affecting Congressional salary from taking effect until the beginning of the next session of Congress. This amendment was proposed September 25, 1789 and enacted 203 years later in May 1992.

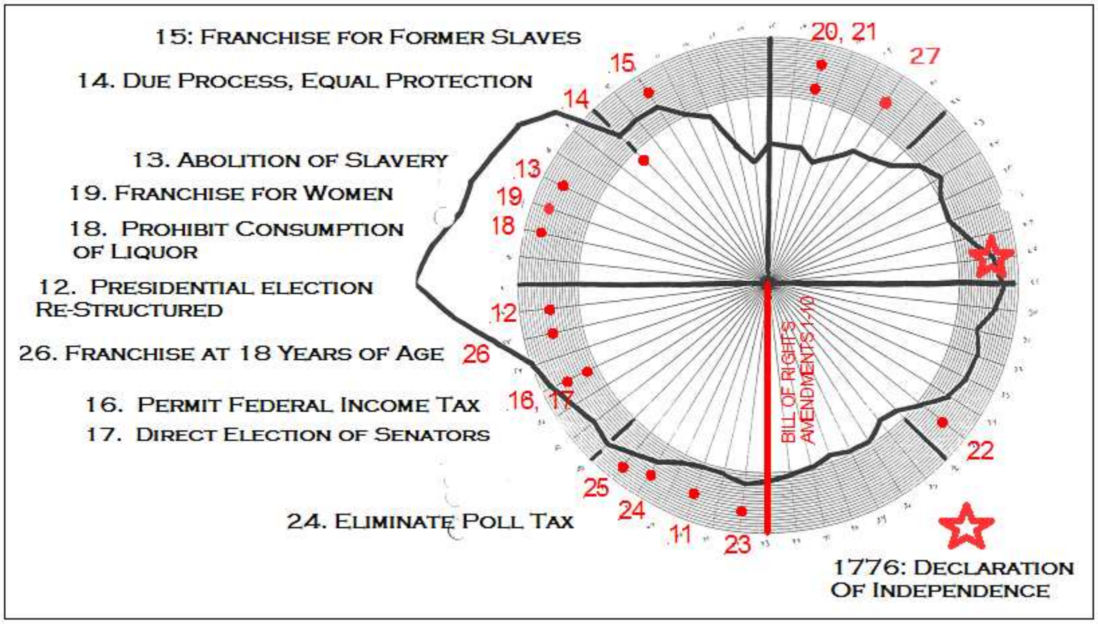
We might also consider the two remaining Amendments on the right hand side of the cycle. Both enacted in 1933, Amendment 20 determined the dates of term commencements for Congress and the President and Amendment 21 repealed the federal prohibition on consumption of alcohol. Amendment 20 was a purely administrative amendment and Amendment 21 returned the country to a well-established social norm.

It is of course possible to take any data set and superimpose upon it a spiral of any sort. The list of Amendments to the Federal Constitution is useful in this analysis because:

> (1) each Amendment carries with it a specific date of adoption, thereby making placement in the cycle non-controversial,
>
> (2) each Amendment engages the entire United States by virtue of the centrality of the Federal Constitution and the difficulties posed in their adoption,
>
> (3) each Amendment declares in the clearest possible terms what is intended, albeit this interpretation remains subject of further interpretation by the courts, and
>
> (4) each Amendment remains an influence upon continued American development. In many cases these Amendments are intended to direct the process of the economic future of the American people away from evils previously experienced (slavery, disenfranchisement of African-Americans, women and persons of draft age, resistance to federal taxation of income, addiction to alcohol, unjust use of governmental powers, etc.)

It should be borne in mind that, while the use of other data sets may contest the significance of this cycle, at this point we attempt simply to understand this model, explore the origin of the Golden Mean within the American economy and consider the sort of "balancing" which permits it.

The numerous amendments on the left-hand side of the circuit above should be contrasted with one of the most fundamental documents of American economic history occurring on the right-hand side of the circuit, the Declaration of Independence of 1776. This document makes clear that the colonists did not perceive themselves as setting forth upon some new and novel declaration of rights. Rather they viewed themselves as collectively determined to continue to enjoy rights which they already possessed.



Regarding George III the colonists declared in their first five grievances:

> He has refused his assent to laws, the most wholesome and necessary for the public good.
>
> He has forbidden his governors to pass laws of immediate and pressing importance, unless suspended in their operation till his assent should be obtained; and when so suspended, he has utterly neglected to attend to them.
>
> He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the legislature, a right inestimable to them and formidable to tyrants only.
>
> He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public records, for the sole purpose of fatiguing them into compliance with his measures.
>
> He has dissolved representative houses repeatedly, for opposing with manly firmness his invasions on the rights of the people.

The remainder of the Declaration of Independence describes in ever expanding detail the list of wrongs done by the king to his colonists. Each of these royal acts or omissions justified – at least in the minds of the signatory colonists – an immediate separation of the colonies from the crown in protection of long-held rights, customs and privileges.

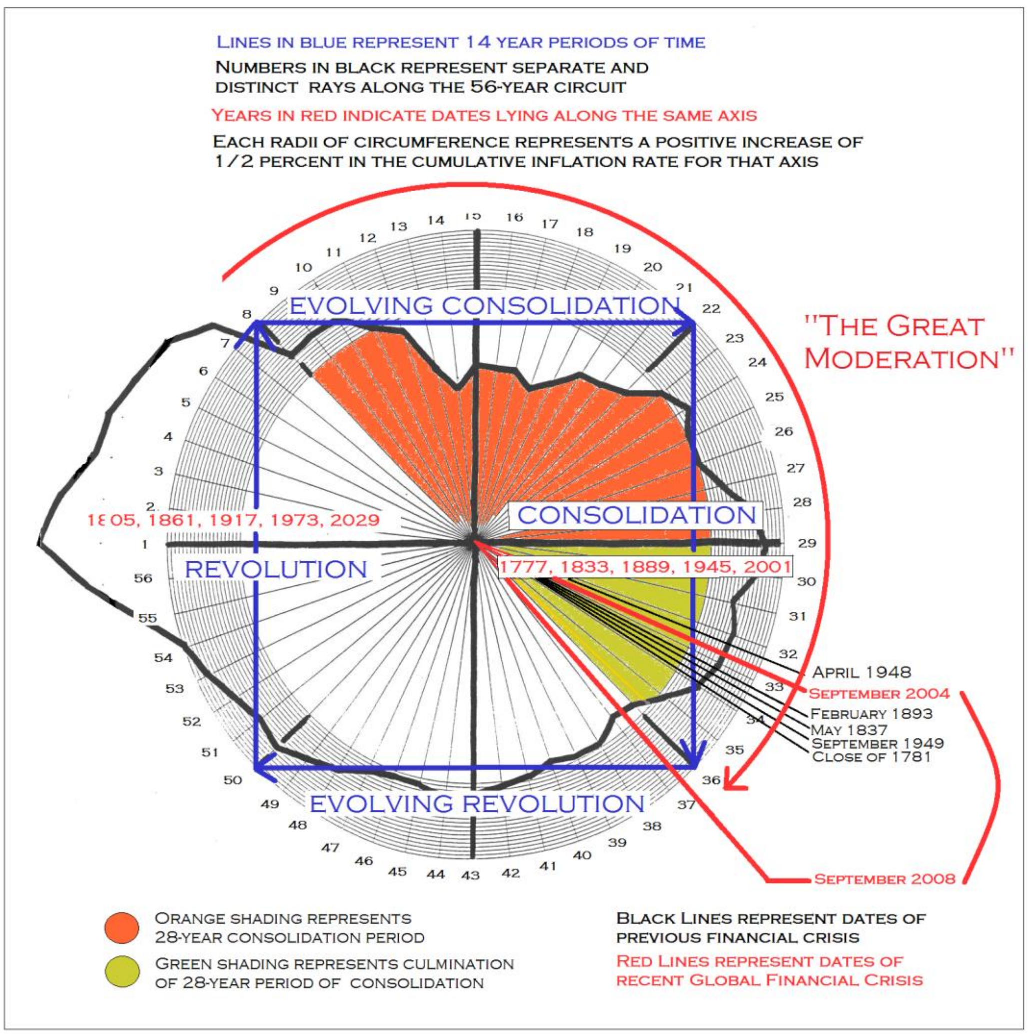
The correlation between Amendments to the Federal Constitution and the 56-year circuit envisioned by this model provides support for the proposition that the circuit itself is an important part of the underlying social fabric of the United States and its political economy. The Amendments are not scattered uniformly around the spiral but rather are grouped almost entirely on the left-hand side. These Amendments generally alter American political life in quite dramatic ways. Amendments to the right of the cycle are very few and generally intended to honor and fix firmly past traditions and social mores.

The discovery of this "bi-polarity" of American political life suggests the possibility that that the four 14-year segments of time which have been used as the foundation of this circuit may themselves have importance. If this is granted we may now expand this model into an understanding of the underlying nature of the political economy of the United States over time.

10. We now speculate as to the nature of the right-left division underlying the GNP Spiral. This will conclude the final step of our analysis of American Economic History.

For the purposes of this paper regarding American economic history, let us define a "*Belief-system*" as the constellation of ideas surrounding any principle of governance: a monarchy, the bourgeoisie, slavery, the relationship of labor to capital, etc. Second, let us define the term "*Revolution*" as a period of time when significant portions of a time-honored belief-systems are destroyed and when new and largely untried belief systems are inaugurated. Third, let us define in contradistinction to "Revolution" the term "*Consolidation*" as an opposing historical period in which honor or reverence are given to relatively recent belief-systems in a manner calculated to preserve and prolong them. It would appear that the left half of the circuit is "revolutionary" in character, while the right half is "consolidating" in character in the context of historic American belief systems.

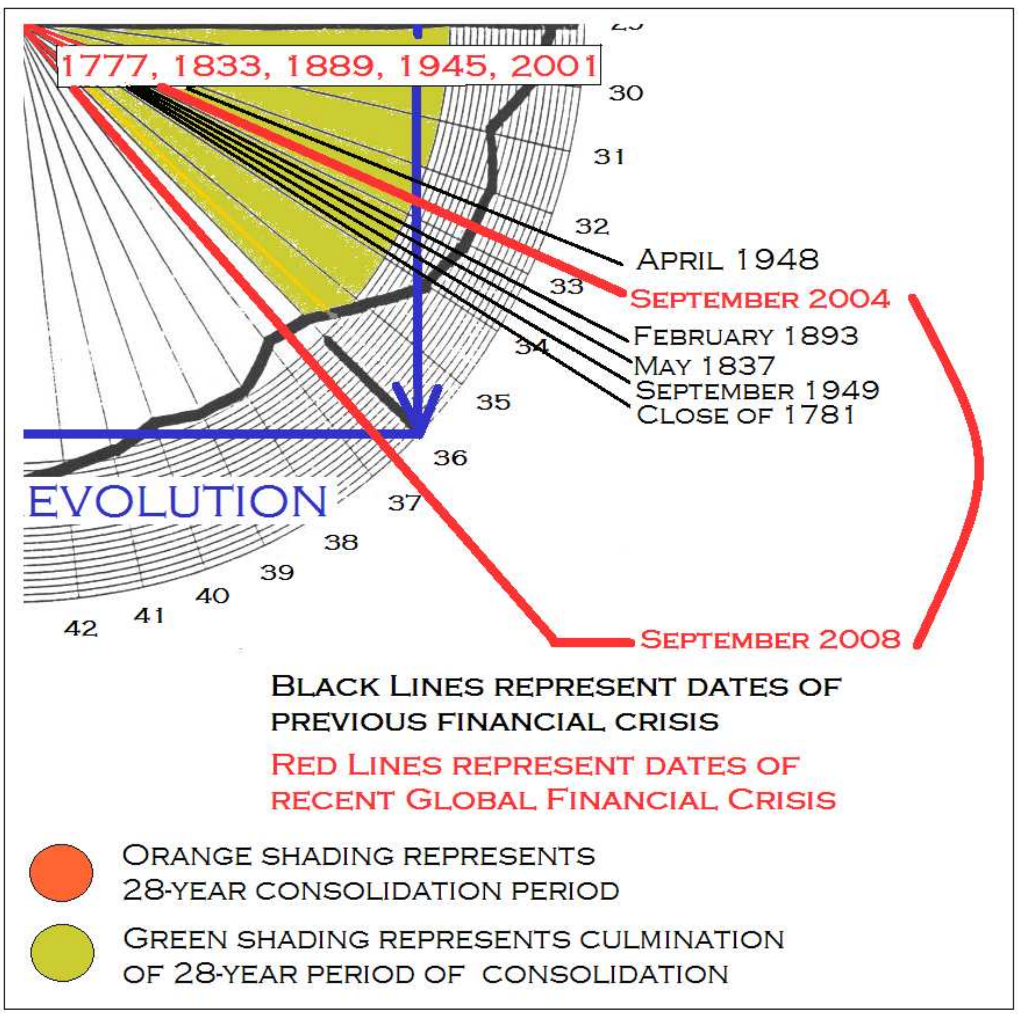
In light of the numerous constitutional amendments adopted on the left-hand side of the circuit, and the virtual lack thereof on the right-hand side, let us label each of the segments of American History as follows:



Note in the above that as each period of consolidation has come to its close, the United States has very predictably experienced a complete meltdown of the economy. This occurred most recently in September through December of 2008, the last months of the terms of George W. Bush. Prior events of similar magnitude are:

1. The collapse of the colonial economy, circa 1781,
2. The Panic of 1837,
3. The Panic of 1893 and
4. The Marshall Plan of 1948 and the events of 1949.

Two unusual characteristics of the recent global meltdown should be pointed out. These are (1) the difficulty of "dating" the recent crisis, and (2) the delay of the expected time of crisis. Let us consider these important points briefly.



Each of the previous dates of "meltdown" clearly corresponded with events between axes 33 and 34. A description of these crises may be given simply by citing textbooks of American History.

> Colonial meltdown of 1781
> "In 1764 Parliament had outlawed paper money in the colonies altogether. Independence ended this restriction, and both the Continental Congress and the states printed large amounts of money during the Revolution, with inflationary results. To cite some examples, the Continental dollar became utterly worthless by 1781, and Virginia eventually called in its paper money at 1,000 to 1."[17]

> Panic of 1837
> "In 1836 the second United States Bank automatically came to the end of its checkered career and the country under the inspiration of the new democracy entered an epoch of "wild cat" finance. The very next year (May, 1837), a terrible business depression fell like a blight upon the land, bringing as usual more suffering to farmers and mechanics than to the "rich and wellborn"; but this calamity was likewise attributed by the masses to the machinations of the money power rather than to the conduct of their hero, President Jackson. Nothing would induce them to retrace their steps. For three decades a union of the South and West prevented a restoration of the centralized banking system. Not until the planting statesmen withdrew from Congress and the storm of the Civil War swept minor gusts before it were the ravages wrought by Jackson repaired by the directors of affairs in Washington."[18]

> Panic of 1893
> "The (Cleveland) Administration was not three months old when a series of bank failure and industrial collapses inaugurated the panic of (February) 1893. The treasury's gold reserve was depleted by an excess of imports and by liquidation of American securities in London after a panic there. Gold was subject to a steady drain by the monthly purchase of useless silver required by the Silver Purchase Act of 1890, and by the redemption of greenbacks which by law which were promptly reissued and formed an "endless chain for conveying gold to Europe."[19]

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17 John A Garraty, *The American Nation, A History of the United States*, Harper-American Heritage Textbook, p. 144.

18 Charles A. Beard, Mary R. Beard, *The Rise of American Civilization*, New Edition, Macmillan Company, New York., p. 570-571.

19 Garraty, p. 795.

Reviewing the same axes for the years 1948-1949, we have, in addition to the creation of the Marshall Plan to rebuild post-war Europe (April 1948), the following:

> 1949
> In 1949 a business recession occurred and prices declined slightly. (p. 819) … Further alarmed by the news, released in September 1949, that the Russians had produced an atomic bomb, Congress appropriated $1.5 billion to arm NATO and in 1951 General Eisenhower was recalled to active duty and placed in command of all NATO forces. (p. 785) … This (civil war in China) resulted in the total defeat of the nationalists; by the end of 1949 Mao ruled all China and Chiang's shattered armies had fled to sanctuary on the island of Formosa, now called Taiwan. This loss of over half a billion souls to communism caused an outburst of indignation in the United States and deeply divided the American people. Critics claimed that Truman had not backed the nationalists strongly enough and that he had stupidly underestimated both Mao's power and his dedication to the cause of world revolution. (p. 786)[20]

The recent Global Financial Crisis began when, in September 2004, the FBI reported that it had uncovered widespread fraud in the home mortgage market (axis 32). The date of this FBI report precedes the axes of the above mentioned crises, i.e. 1781, 1837, 1893 and 1948-1949, by a matter of months. However, and unlike previous crises, action to correct these frauds was not undertaken and the final implosion was delayed for four years, i.e. to September 2008, two months before the election of Barack Obama. Public reaction, not unlike previous moments along axis 33, has been extremely suspicious about the timing and origin of this world-wide panic. [21]

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[20] Garraty, p. 786.

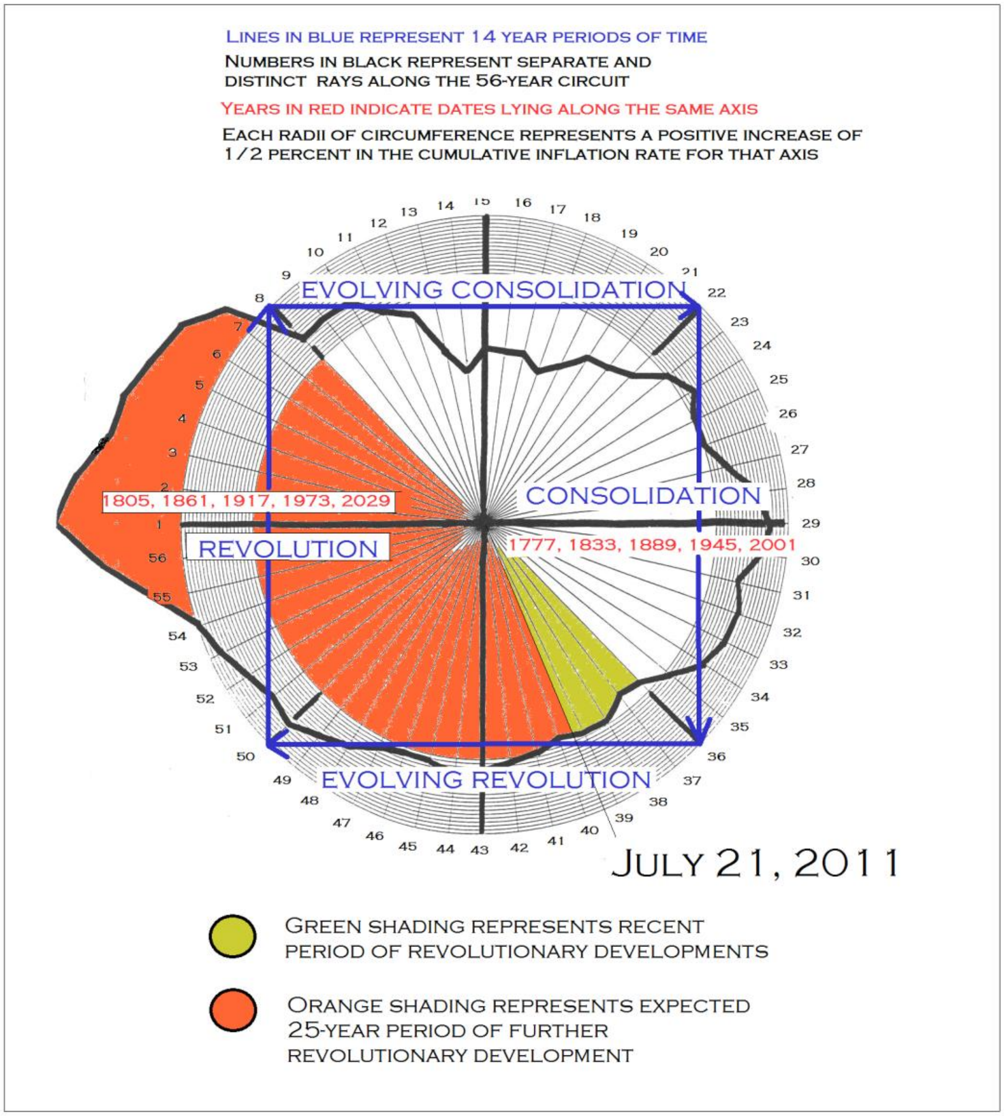
[21] See e.g. House Bill 3995, presented by Representative Kaptur, November 3, 2009:

"(4) Fraud also played a decisive role in the Savings and Loan crisis (of the late 1980s and early 1990s). The FBI and Justice Department made prosecuting those elite frauds among its highest priorities. This took a massive commitment of FBI resources, but it produced the most successful prosecution of an epidemic of elite fraud in history--over 1,000 `priority' felony convictions of senior insiders, according to Professor William K. Black in his book `The Best Way to Rob a Bank is to Own One'.

(5) However, the FBI, because of its crippling personnel limitations, has been unable to assign sufficient FBI agents assigned to investigate the current global financial crisis. The FBI identified the mortgage fraud `epidemic' in congressional testimony in September 2004. It had so few white-collar crime specialists available, however, that it was able to assign only 120 special agents to mortgage fraud cases--less than one-eighth the agents it found essential to respond adequately to the huge, but far smaller, Savings and Loan crisis.

(6) Given the magnitude of the financial crisis of 2008 and the resulting losses and billions of taxpayer dollars spent to keep the financial system from collapsing, the FBI should have no less than 1,000 agents to address corporate, securities, and mortgage fraud located across the country, and, in addition, more forensic experts and Federal prosecutors to uncover the crimes committed and bring the perpetrators to justice."

To conclude our speculation as to the nature of this circuit brings us to a discussion of the current events of today. We are, today, at the dividing line between green and orange in the graph below.



The green portion of the above represents the beginning of an evolving revolutionary trend starting in 2008.

This green section correlates to an impressive extent with the current difficulties faced by the United States in the Middle East. Note that as of May 26, 2011 the United States has attempted to deal with a number of revolutionary changes throughout the Arab world over the past 4 months. These have included but are not limited to: Tunisia, Egypt, Libya, Bahrain, Yemen, Syria, Morocco and Algeria. These events have become known popularly as “The Arab Spring.” Chronologically, these were preceded by the 2009 Revolution in Iran. The fact that these events are taking place at the very beginning of the “Evolving Revolution” segment of American economic history may presage much greater events to come.

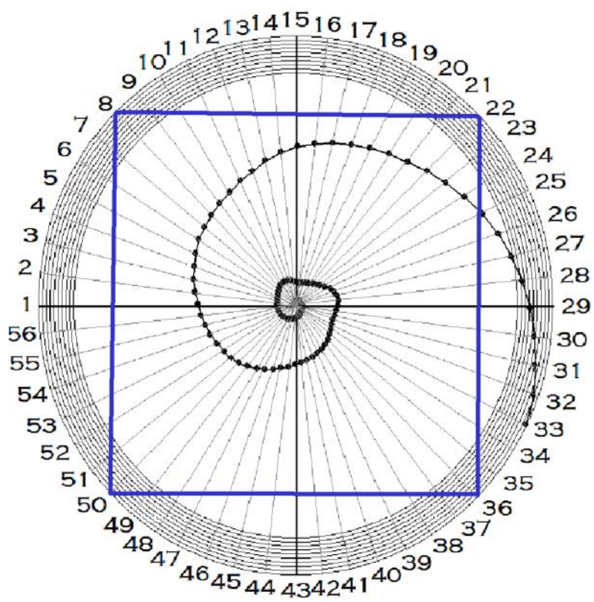
A strong correlation between the onset of inflation and the axes of this period has been described by this model. The graph above demonstrates the historic inflationary rise which typically accompanies this period of American economic history.

The amount of orange given in the above development towards revolution represents inflation, the strength of which emerges most dramatically along the left-pointing axis at nine o'clock. These years represent very difficult times in the history of the United States – the coming of the war with Britain in 1812 during which the White House, the Capitol, the Library of Congress and the Treasury were burned to the ground (1814); the American Civil War beginning in 1861 ending in the assassination of President Lincoln in 1865; the First World War beginning for the United States in 1917; and the OPEC Embargo of 1973. This axis brings revolutionary times of great uncertainty, a forced re-reading of America's place in world history.

A Brief Comparison of the GNP Spiral to Existing Long-Wave Research

Renewed interest in the Kondratiev Wave, or Long Wave, has followed the recent global financial crisis. It is possible that the scholarship which has been generated by the Long Wave theory over the past century may be important to consider in evaluating this model and its presentation of American economic history.

	Date	Date	Date	Date	Date	Date
14	1762	1818	1874	1930	1986	
13	1761	1817	1873	1929	1985	
12	1760	1816	1872	1928	1984	
11	1769	1815	1871	1927	1983	
10	1768	1814	1870	1926	1982	
9	1767	1813	1869	1925	1981	
8	1766	1812	1868	1924	1980	2036
7	1765	1811	1867	1923	1979	2035
6	1764	1810	1866	1922	1978	2034
5	1763	1809	1865	1921	1977	2033
4	1762	1808	1864	1920	1976	2032
3	1761	1807	1863	1919	1975	2031
2	1760	1806	1862	1918	1974	2030
1	1759	1805	1861	1917	1973	2029
56		1804	1860	1916	1972	2028
55		1803	1859	1915	1971	2027
54		1802	1858	1914	1970	2026
53		1801	1857	1913	1969	2025
52		1800	1856	1912	1968	2024
51		1799	1855	1911	1967	2023
50		1798	1854	1910	1966	2022
49		1797	1853	1909	1965	2021
48		1796	1852	1908	1964	2020
47		1795	1851	1907	1963	2019
46		1794	1850	1906	1962	2018
45		1793	1849	1905	1961	2017
44		1792	1848	1904	1960	2016
43		1791	1847	1903	1959	2015



	Date	Date	Date	Date	Date
15	1763	1819	1875	1931	1987
16	1764	1820	1876	1932	1988
17	1765	1821	1877	1933	1989
18	1766	1822	1878	1934	1990
19	1767	1823	1879	1935	1991
20	1768	1824	1880	1936	1992
21	1769	1825	1881	1937	1993
22	1770	1826	1882	1938	1994
23	1771	1827	1883	1939	1995
24	1772	1828	1884	1940	1996
25	1773	1829	1885	1941	1997
26	1774	1830	1886	1942	1998
27	1775	1831	1887	1943	1999
28	1776	1832	1888	1944	2000
29	1777	1833	1889	1945	2001
30	1778	1834	1890	1946	2002
31	1779	1835	1891	1947	2003
32	1780	1856	1892	1948	2004
33	1781	1837	1893	1949	2005
34	1782	1838	1894	1950	2006
35	1783	1839	1895	1951	2007
36	1784	1840	1896	1952	2008
37	1785	1841	1897	1953	2009
38	1786	1842	1898	1954	2010
39	1787	1843	1899	1955	2011
40	1788	1844	1900	1956	2012
41	1789	1845	1901	1957	2013
42	1790	1846	1902	1958	2014

Moreover the discovery of the Golden Mean at the intersection of price and productivity in the United States in a strict 56-year cycle permits us to evaluate from a more neutral and objective point of view a great deal of research on Kondratiev Waves, at least as it pertains to the American economy.

We may superimpose Kondratiev's thesis upon the foregoing model of American economic history. It is important to emphasize the word *American* because Kondratiev was not concerned exclusively with the economy of the United States, nor do present long-wave theorists necessarily limit their interests to a single country.

Using the dates for periods of upswing and downswing as given by Kondratiev himself, the following correlations may be made. (Korotayev and Tsirel, 2010:2)

	Date	Date	Date	Date	Date	Date
14	1762	1818	1874	1930	1986	
13	1761	1817	1873	1929	1985	
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5	1763	1809	1865	1921	1977	2033
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3	1761	1807	1863	1919	1975	2031
2	1760	1806	1862	1918	1974	2030
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52		1800	1856	1912	1968	2024
51		1799	1855	1911	1967	2023
50		1798	1854	1910	1966	2022
49		1797	1853	1909	1965	2021
48		1796	1852	1908	1964	2020
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46		1794	1850	1906	1962	2018
45		1793	1849	1905	1961	2017
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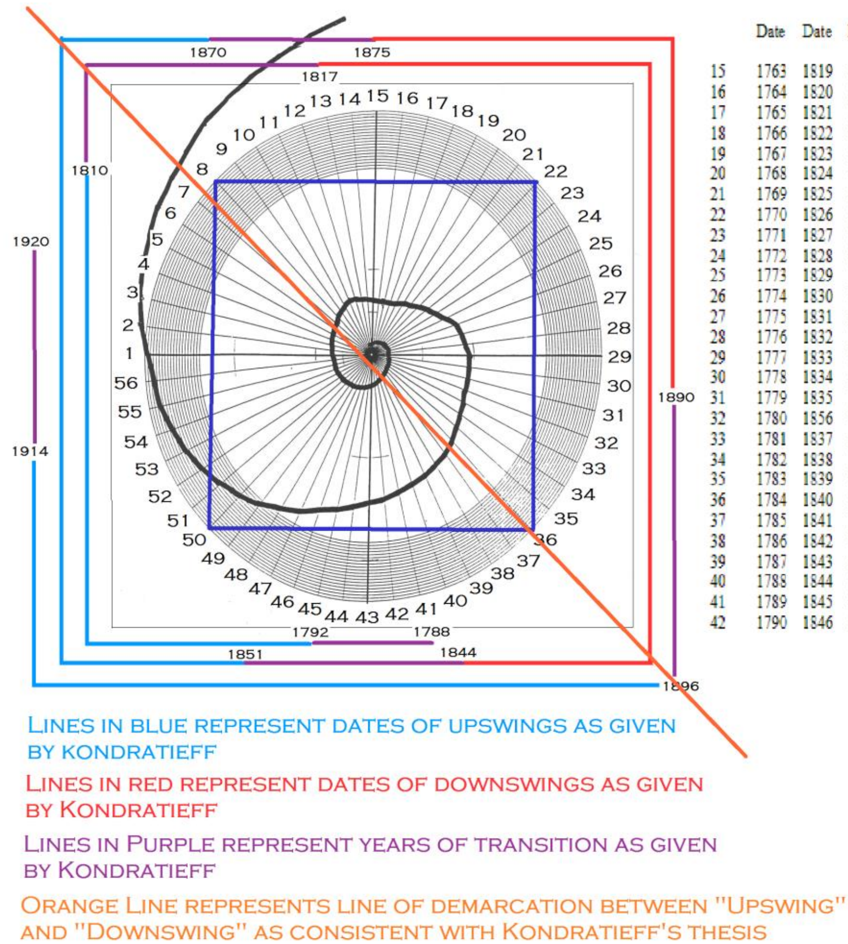

	Date	Date	Date	Date	Date
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17	1765	1821	1877	1933	1989
18	1766	1822	1878	1934	1990
19	1767	1823	1879	1935	1991
20	1768	1824	1880	1936	1992
21	1769	1825	1881	1937	1993
22	1770	1826	1882	1938	1994
23	1771	1827	1883	1939	1995
24	1772	1828	1884	1940	1996
25	1773	1829	1885	1941	1997
26	1774	1830	1886	1942	1998
27	1775	1831	1887	1943	1999
28	1776	1832	1888	1944	2000
29	1777	1833	1889	1945	2001
30	1778	1834	1890	1946	2002
31	1779	1835	1891	1947	2003
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There is a distinct similarity between the classic Kondratiev thesis and the GNP Spiral, at least in so far as the turning point from "Evolving Revolution" to "Revolution" (bottom left corner) is consistently found in the midst of an established "upswing" as noticed by Kondratiev, and the turning point from "Evolving Consolidation" to "Consolidation" (upper right corner) is consistently found in the midst of a well-established "downswing," again as noticed by Kondratiev. On this basis alone it would appear that Kondratiev's thesis suggests a dramatic dichotomy running from Northwest to Southeast, as presented earlier (orange line above).

A somewhat similar plan is given by at least one recent scholar. (Jourdon, 2010)[22] In this case the lower left hand corner wherein "Evolving Revolution" changes to "Revolution" is in the midst of an "upswing" and the upper right hand corner wherein "Evolving Consolidation" changes to "Consolidation" is contained within, if not central to, a "downswing."[23]

	Date	Date	Date	Date	Date	Date
14	1762	1818	1874	1930	1986	
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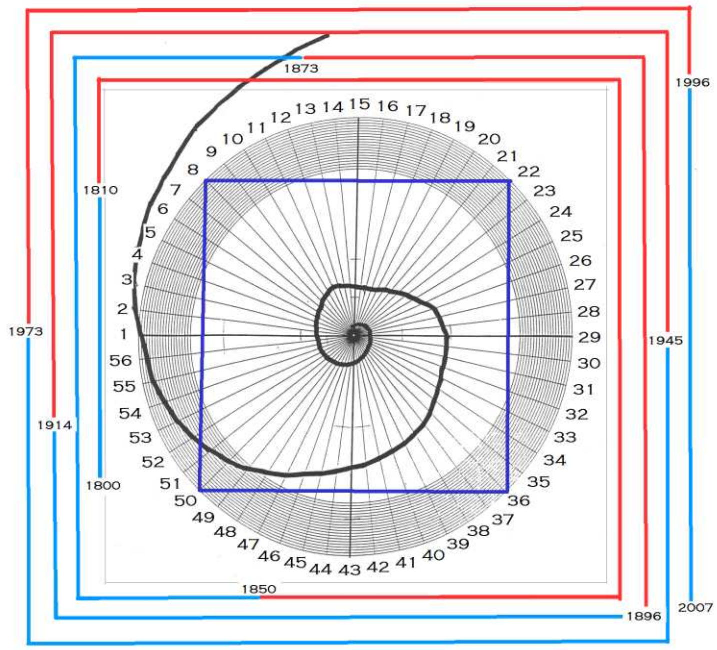

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23	1771	1827	1883	1939	1995
24	1772	1828	1884	1940	1996
25	1773	1829	1885	1941	1997
26	1774	1830	1886	1942	1998
27	1775	1831	1887	1943	1999
28	1776	1832	1888	1944	2000
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40	1788	1844	1900	1956	2012
41	1789	1845	1901	1957	2013
42	1790	1846	1902	1958	2014

LINES IN RED REPRESENT DOWNSWINGS AS GIVEN BY JOURDON IN ACCORD WITH KONDRATIEV

LINES IN BLUE REPRESENT UPSWINGS AS GIVEN BY JOURDON IN ACCORD WITH KONDRATIEV

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22 The authors gratefully acknowledge the assistance of the anonymous referee in acquainting us with the work of M. Jourdon.

23 This accords well with Marchetti, 1988:7. "All together I think the idea of 55 year cycles in the behavior of our society is one of the most penetrating and useful in organizing social and economic facts."

The matter is not uniformly understood however and changes when we add dates provided by other scholars. (Korotayev and Tsirel, 2009:2)

	Date	Date	Date	Date	Date	Date
14	1762	1818	1874	1930	1986	
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55		1803	1859	1915	1971	2027
54		1802	1858	1914	1970	2026
53		1801	1857	1913	1969	2025
52		1800	1856	1912	1968	2024
51		1799	1855	1911	1967	2023
50		1798	1854	1910	1966	2022
49		1797	1853	1909	1965	2021
48		1796	1852	1908	1964	2020
47		1795	1851	1907	1963	2019
46		1794	1850	1906	1962	2018
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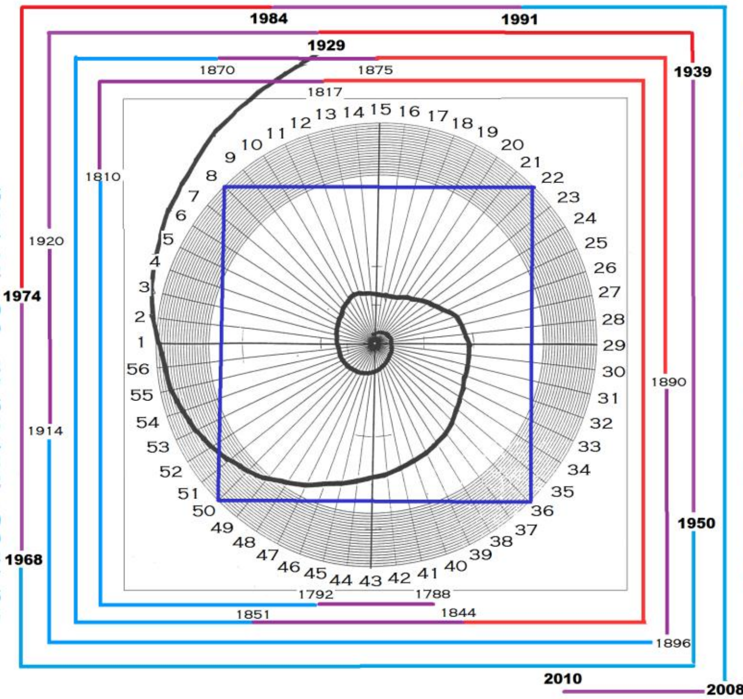
43		1791	1847	1903	1959	2015



	Date	Date	Date	Date	Date
15	1763	1819	1875	1931	1987
16	1764	1820	1876	1932	1988
17	1765	1821	1877	1933	1989
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19	1767	1823	1879	1935	1991
20	1768	1824	1880	1936	1992
21	1769	1825	1881	1937	1993
22	1770	1826	1882	1938	1994
23	1771	1827	1883	1939	1995
24	1772	1828	1884	1940	1996
25	1773	1829	1885	1941	1997
26	1774	1830	1886	1942	1998
27	1775	1831	1887	1943	1999
28	1776	1832	1888	1944	2000
29	1777	1833	1889	1945	2001
30	1778	1834	1890	1946	2002
31	1779	1835	1891	1947	2003
32	1780	1856	1892	1948	2004
33	1781	1837	1893	1949	2005
34	1782	1838	1894	1950	2006
35	1783	1839	1895	1951	2007
36	1784	1840	1896	1952	2008
37	1785	1841	1897	1953	2009
38	1786	1842	1898	1954	2010
39	1787	1843	1899	1955	2011
40	1788	1844	1900	1956	2012
41	1789	1845	1901	1957	2013
42	1790	1846	1902	1958	2014

LINES IN BLUE REPRESENT DATES OF UPSWINGS AS GIVEN BY KONDRATIEFF
LINES IN RED REPRESENT DATES OF DOWNSWINGS AS GIVEN BY KONDRATIEFF
LINES IN PURPLE REPRESENT YEARS OF TRANSITION AS GIVEN BY KONDRATIEFF
DATES IN HEAVY BLACK PRINT ARE POST-KONDRATIEFF

Modern research on Kondratiev Waves (Korotayev, Tsirel 2010) holds that Long Wave scholars agree upon a very long period of "transition" running between the period 1914-1929 wherein we move from "upswing" to "downswing."[24] This is a "transition period" of 15 years, more than one quarter of a 56-year cycle.

The upper-right corner of 1938, wherein according to this model "Evolving Consolidation" changes to "Consolidation," remains a part of an established "downswing," as would be consistent with the two prior "upper-right corner" years of 1826 and 1882. At this point, however, another extended 11-year period of "transition" is given for the years 1939 through 1950.

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[24] Korotayev and Tsirel cite the following sources for "'Post-Kondtratiev' Long Waves and Their Phases." These include, but are not limited to,: Mandel 1980; Dickson 1983; Van Duijn 1983:155; Wallerstein 1984; Goldstein 1988:67; Modelski, Thompson 1996; Pantin, Lapkin 2006: 283-285, 315; Ayres 2006; Linstone 2006: Fig. 1; Tausch 2006:101-104; Thompson 2007: Table 5; Jourdon 2008: 1040-1043.

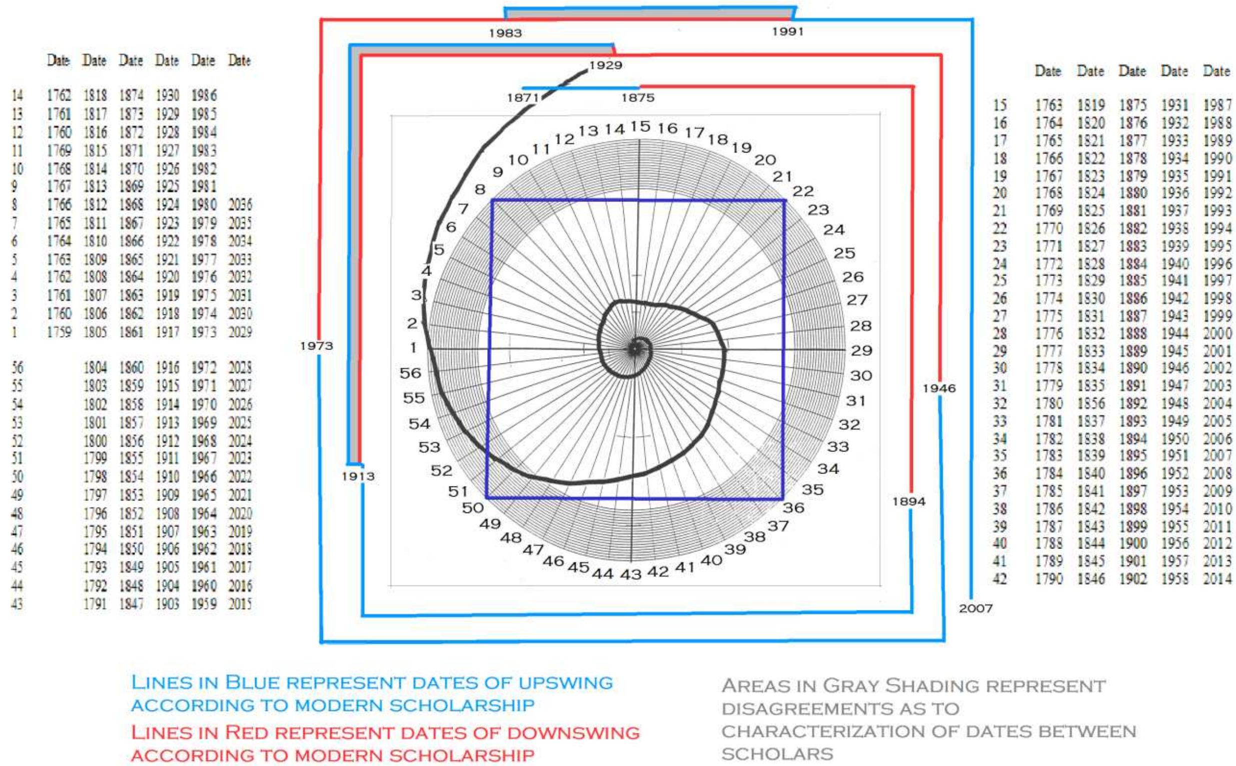
The lower left corner, 1966, wherein "Evolving Revolution" changes to "Revolution," remains as part of an established "upswing" in the economy. This is quite consistent with Kondratiev's expectations for this period of the cycle.

However the dates of a new downturn, this time beginning in 1974 and extending to 1984 are again contrary to what one would expect during this period. The "upswing" that is given for the dates 1991 through 2008 is completely out-of-character with what one would expect from Kondratiev's own thesis for this portion of the cycle.

Finally it is suggested that we have now entered into a "transition period" of some unknown length. However it would be presumed that we are transitioning from the previous "upswing" running from 1991 through 2008 to a future downswing. This would be entirely contrary to what one would expect from the lower left corner of the model.[25]

[25] There are several views as to how these cycles might be aligned with the classic Kondratiev cycle. (See e.g. Goldstein, 1988:176-178) We argue that – at least as regards the economy of the United States – virtually all of these views would abandon the strict periodicity required by this model, completely destroy the GNP Spiral obtained and make impossible the discovery of the Golden Mean therein.

A further ambiguity is the presence of various versions of modern long-wave theory. (Korotayev, Tsirel 2010:23) These versions are frequently at odds over how to characterize a particular period of time.[26]



In sum, the GNP Spiral accords rather well with the classic Kondratiev thesis and that of Jourdon, but is at odds with much of the dating given by recent scholarship on Long Waves. There may be several reasons for this.

First, modern scholarship on Long Waves frequently seeks out large data bases dealing with the entire globe. Confirmation of Kondratiev Waves in this fashion risks treating the historic experiences of one group with the historic experiences of others and with all. This may lead to important insights being missed while obtaining results which are not universally accepted.

[26] The are a large number of views on Long Wave research (Goldstein, 1988) of which this paper considers but a fraction.

Second, the history of Europe, which preceded that of the United States by centuries and which has been dominated by class struggle and conflict, can not readily be compared to the United States. In consequence the patterns of economic history between these two economic systems should not be equated.

Finally, scholarship surrounding Kondratiev's work has not yet generated extensive empirical agreement. Recourse to the Golden Mean as a regulating structure may provide the support necessary for further study.

Conclusion

It remains to be seen what force or set of forces balance one another so perfectly that we are able to derive an approximation to the Golden Mean of 5.3 parts in 100,000 within the vast scope and panorama of American economic history from 1869 to the present day using such simple tools. What engine "lies under the hood" of such an interesting structure? Why the Golden Mean? And why a strict 56-year cycle?

As to the significance of the GNP Spiral modeled here, one point may be of importance; the increasingly global nature of this spiral stands out. In the previous circuit the financial "meltdown" of 1948 focused principally on Europe; the political meltdowns of 1949 concerned the Communist takeover of China and the discovery that nuclear weapons were in the hands of Joseph Stalin.

The most recent financial panic has encompassed the entire planet with a ferocity and totality which is truly unprecedented. If this expansion of the GNP Spiral is taken into account, current events related to the Arab Spring may be examples of this spiral "going global" and embarking on a new and unprecedented scope.

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July 21, 2011

Appendix 1 (abbreviated) - GNP Data.

Column 1	Column 2	Column 4	Column 6	Column 7	Column 9
Year	Historical Abstract	Historical Abstract as estimated in 1958 dollars for 1971 - 2009 using St. Louis Federal Reserve Figures divided by 5.962552	Multiples calculated between St. Louis Federal Reserve and Historical Abstract 1947 - 1970	St. Louis Federal Reserve Estimate for US Real GNP, 2005 Dollars	Hist. Abstract with extension to 2009 using multiple 5.962552
1868	23.10				23.1000
1869	23.10				23.1000
1870	23.10				23.1000
1871	23.10				23.1000
1872	23.10				23.1000
1873	23.10				23.1000
1874	23.10				23.1000
1875	23.10				23.1000
1876	23.10				23.1000
1877	23.10				23.1000
1878	42.40				42.4000
1879	42.40				42.4000
1880	42.40				42.4000
1881	42.40				42.4000
1882	42.40				42.4000
1883	42.40				42.4000
1884	42.40				42.4000
1885	42.40				42.4000
1886	42.40				42.4000
1887	42.40				42.4000
1888	42.40				42.4000
1889	49.10				49.1000
1890	52.70				52.7000
1891	55.10				55.1000
1892	60.40				60.4000
1893	57.50				57.5000
1894	55.90				55.9000
1895	62.60				62.6000
1896	61.30				61.3000
1897	67.10				67.1000
1898	68.60				68.6000
1899	74.80				74.8000
1900	76.90				76.9000
1901	85.70				85.7000
1902	86.50				86.5000
1903	90.80				90.8000
1904	89.70				89.7000
1905	96.30				96.3000
1906	107.50				107.5000
1907	109.20				109.2000
1908	100.20				100.2000
1909	116.80				116.8000
1910	120.10				120.1000
1911	123.20				123.2000
1912	130.20				130.2000
1913	131.40				131.4000
1914	125.60				125.6000
1915	124.50				124.5000
1916	134.40				134.4000
1917	135.20				135.2000
1918	151.80				151.8000
1919	146.40				146.4000
1920	140.00				140.0000
1921	127.80				127.8000
1922	148.00				148.0000
1923	165.90				165.9000
1924	165.50				165.5000
1925	179.40				179.4000
1926	190.00				190.0000
1927	189.90				189.9000
1928	190.90				190.9000
1929	203.60				203.6000
1930	183.50				183.5000
1931	169.30				169.3000
1932	144.20				144.2000
1933	141.50				141.5000
1934	154.30				154.3000
1935	169.50				169.5000
1936	193.00				193.0000
1937	203.20				203.2000
1938	192.90				192.9000
1939	209.40				209.4000
1940	227.20				227.2000
1941	263.70				263.7000
1942	297.80				297.8000
1943	337.10				337.1000
1944	361.30				361.3000
1945	355.20				355.2000
1946	312.60				312.6000
1947	309.90		5.826073	1805.5	309.9000
1948	323.70		5.814334	1882.1	323.7000
1949	324.10		5.709349	1850.4	324.1000
1950	355.30		5.909372	2099.6	355.3000
1951	383.40		5.765780	2210.6	383.4000
1952	395.10		5.878006	2322.4	395.1000
1953	412.80		5.646318	2330.8	412.8000
1954	407.00		5.892875	2398.4	407.0000
1955	438.00		5.834703	2555.6	438.0000
1956	446.10		5.832997	2602.1	446.1000
1957	452.50		5.764862	2608.6	452.5000
1958	447.30		5.977644	2673.8	447.3000
1959	475.90		5.893255	2804.6	475.9000
1960	487.70		5.789625	2823.6	487.7000
1961	497.20		6.033387	2999.8	497.2000
1962	529.50		5.907649	3128.1	529.5000
1963	551.00		5.974047	3291.7	551.0000
1964	581.10		5.952160	3458.8	581.1000
1965	617.80		6.071220	3750.8	617.8000
1966	658.10		5.945601	3912.8	658.1000
1967	675.20		5.939129	4010.1	675.2000
1968	706.60		5.957260	4209.4	706.6000
1969	725.60		5.915243	4292.1	725.6000
1970	722.50		5.929827	4284.3	722.5000
1971		751.205189		4479.1	751.2051
1972		803.481462		4790.8	803.4814
1973		839.418200		5005.1	839.4182
1974		821.740134		4899.7	821.7401
1975		843.077800		5026.9	843.0778
1976		879.313837		5243.0	879.3138
1977		922.669096		5501.5	922.6690
1978		985.882183		5878.4	985.8821
1979		1001.730450		5972.9	1001.7304
1980		996.830985		5943.7	996.8309
1981		1010.839453		6027.2	1010.8394
1982		995.141170		5933.6	995.1411
1983		1072.572702		6395.3	1072.5727
1984		1129.446482		6734.4	1129.4464
1985		1174.071602		7000.5	1174.0716
1986		1203.268409		7174.6	1203.2684
1987		1256.182622		7490.1	1256.1826
1988		1303.177483		7770.3	1303.1774
1989		1340.043451		7990.1	1340.0434
1990		1351.362214		8057.6	1351.3622
1991		1360.351230		8111.2	1360.3512
1992		1418.014924		8455.0	1418.0149
1993		1454.140974		8670.4	1454.1409
1994		1514.394384		9029.7	1514.3943
1995		1546.730848		9222.5	1546.7308
1996		1615.003381		9629.5	1615.0033
1997		1681.876068		10028.3	1681.8760
1998		1764.537028		10521.1	1764.5370
1999		1854.067237		11055.0	1854.0672
2000		1911.320976		11396.4	1911.3209
2001		1925.179460		11479.0	1925.1794
2002		1957.195959		11669.9	1957.1959
2003		2036.067333		12140.2	2036.0677
2004		2093.681033		12483.7	2093.6810
2005		2151.024762		12825.6	2151.0247
2006		2201.989188		13129.5	2201.9891
2007		2272.261503		13548.5	2272.2615
2008		2198.629555		13109.4	2198.6295
2009		2208.798443		13170.1	2208.7984

Appendix 4 - Inflation Data.

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Year	Consumer Price Index, Statistical Abstract 1997	Multiple	Consumer Price Index Historical Statistics of U.S.	Extended Series 1800-1993	7-Yr Average	Change	Change/Average
1801			50.00	50.00			
1802			43.00	43.00			
1803			45.00	45.00			
1804			45.00	45.00	45.57		
1805			45.00	45.00	45.29	-0.29	-0.006
1806			47.00	47.00	45.86	0.57	0.012
1807			44.00	44.00	46.14	0.29	0.006
1808			48.00	48.00	46.86	0.71	0.015
1809			47.00	47.00	47.71	0.86	0.018
1810			47.00	47.00	49.29	1.57	0.032
1811			50.00	50.00	52.00	2.71	0.052
1812			51.00	51.00	53.00	1.00	0.019
1813			58.00	58.00	53.57	0.57	0.011
1814			63.00	63.00	53.71	0.14	0.003
1815			55.00	55.00	53.14	-0.57	-0.011
1816			51.00	51.00	52.43	-0.71	-0.014
1817			48.00	48.00	50.14	-2.29	-0.046
1818			46.00	46.00	46.86	-3.29	-0.070
1819			46.00	46.00	44.71	-2.14	-0.048
1820			42.00	42.00	42.57	-2.14	-0.050
1821			40.00	40.00	40.43	-2.14	-0.053
1822			40.00	40.00	38.71	-1.71	-0.044
1823			36.00	36.00	37.00	-1.71	-0.046
1824			33.00	33.00	35.86	-1.14	-0.032
1825			34.00	34.00	34.86	-1.00	-0.029
1826			34.00	34.00	33.71	-1.14	-0.034
1827			34.00	34.00	33.14	-0.57	-0.017
1828			33.00	33.00	33.00	-0.14	-0.004
1829			32.00	32.00	32.43	-0.57	-0.018
1830			32.00	32.00	31.71	-0.71	-0.023
1831			32.00	32.00	31.14	-0.57	-0.018
1832			30.00	30.00	30.86	-0.29	-0.009
1833			29.00	29.00	31.00	0.14	0.005
1834			30.00	30.00	31.29	0.29	0.009
1835			31.00	31.00	31.29	0.00	0.000
1836			33.00	33.00	31.57	0.29	0.009
1837			34.00	34.00	31.71	0.14	0.005
1838			32.00	32.00	31.86	0.14	0.004
1839			32.00	32.00	31.57	-0.29	-0.009
1840			30.00	30.00	30.86	-0.71	-0.023
1841			31.00	31.00	30.00	-0.86	-0.029
1842			29.00	29.00	29.43	-0.57	-0.019
1843			28.00	28.00	28.71	-0.71	-0.025
1844			28.00	28.00	28.43	-0.29	-0.010
1845			28.00	28.00	27.71	-0.71	-0.026
1846			27.00	27.00	27.14	-0.57	-0.021
1847			28.00	28.00	26.71	-0.43	-0.016
1848			26.00	26.00	26.29	-0.43	-0.016
1849			25.00	25.00	25.86	-0.43	-0.017
1850			25.00	25.00	25.57	-0.29	-0.011
1851			25.00	25.00	25.43	-0.14	-0.006
1852			25.00	25.00	25.71	0.29	0.011
1853			25.00	25.00	26.00	0.29	0.011
1854			27.00	27.00	26.43	0.43	0.016
1855			28.00	28.00	26.57	0.14	0.005
1856			27.00	27.00	26.86	0.29	0.011
1857			28.00	28.00	27.14	0.29	0.011
1858			26.00	26.00	27.14	0.00	0.000
1859			27.00	27.00	27.43	0.29	0.010
1860			27.00	27.00	28.86	1.43	0.050
1861			27.00	27.00	31.57	2.71	0.086
1862			30.00	30.00	34.43	2.86	0.083
1863			37.00	37.00	36.86	2.43	0.066
1864			47.00	47.00	39.00	2.14	0.055
1865			46.00	46.00	40.86	1.86	0.045
1866			44.00	44.00	42.29	1.43	0.034
1867			42.00	42.00	42.43	0.14	0.003
1868			40.00	40.00	40.86	-1.57	-0.038
1869			40.00	40.00	39.43	-1.43	-0.036
1870			38.00	38.00	38.29	-1.14	-0.030
1871			36.00	36.00	37.14	-1.14	-0.031
1872			36.00	36.00	36.14	-1.00	-0.028
1873			36.00	36.00	35.00	-1.14	-0.033
1874			34.00	34.00	34.14	-0.86	-0.025
1875			33.00	33.00	33.14	-1.00	-0.030
1876			32.00	32.00	32.00	-1.14	-0.036
1877			32.00	32.00	31.00	-1.00	-0.032
1878			29.00	29.00	30.29	-0.71	-0.024
1879			28.00	28.00	29.71	-0.57	-0.019
1880			29.00	29.00	29.14	-0.57	-0.020
1881			29.00	29.00	28.43	-0.71	-0.025
1882			29.00	29.00	28.14	-0.29	-0.010
1883			28.00	28.00	28.00	-0.14	-0.005
1884			27.00	27.00	27.71	-0.29	-0.010
1885			27.00	27.00	27.43	-0.29	-0.010
1886			27.00	27.00	27.14	-0.29	-0.011
1887			27.00	27.00	27.00	-0.14	-0.005
1888			27.00	27.00	27.00	0.00	0.000
1889			27.00	27.00	27.00	0.00	0.000
1890			27.00	27.00	27.00	0.00	0.000
1891			27.00	27.00	26.86	-0.14	-0.005
1892			27.00	27.00	26.57	-0.29	-0.011
1893			27.00	27.00	26.29	-0.29	-0.011
1894			26.00	26.00	26.00	-0.29	-0.011
1895			25.00	25.00	25.71	-0.29	-0.011
1896			25.00	25.00	25.43	-0.29	-0.011
1897			25.00	25.00	25.14	-0.29	-0.011
1898			25.00	25.00	25.00	-0.14	-0.006
1899			25.00	25.00	25.14	0.14	0.006
1900			25.00	25.00	25.43	0.29	0.011
1901			25.00	25.00	25.71	0.29	0.011
1902			26.00	26.00	26.00	0.29	0.011
1903			27.00	27.00	26.29	0.29	0.011
1904			27.00	27.00	26.71	0.43	0.016
1905			27.00	27.00	27.00	0.29	0.011
1906			27.00	27.00	27.14	0.14	0.005
1907			28.00	28.00	27.29	0.14	0.005
1908			27.00	27.00	27.43	0.14	0.005
1909			27.00	27.00	27.71	0.29	0.010
1910			28.00	28.00	28.10	0.39	0.014
1911			28.00	28.00	28.40	0.30	0.011
1912			29.00	29.00	28.89	0.49	0.017
1913			29.70	29.70	29.70	0.81	0.027
1914			30.10	30.10	31.19	1.49	0.048
1915			30.40	30.40	33.63	2.44	0.073
1916			32.70	32.70	36.89	3.26	0.088
1917			38.40	38.40	41.21	4.33	0.105
1918			45.10	45.10	44.57	3.36	0.075
1919			51.80	51.80	47.40	2.83	0.060
1920			60.00	60.00	50.03	2.63	0.053
1921			53.60	53.60	51.86	1.83	0.035
1922			50.20	50.20	52.91	1.06	0.020
1923			51.10	51.10	53.09	0.17	0.003
1924			51.20	51.20	51.94	-1.14	-0.022
1925			52.50	52.50	51.61	-0.33	-0.006
1926			53.00	53.00	51.77	0.16	0.003
1927			52.00	52.00	51.61	-0.16	-0.003
1928			51.30	51.30	50.81	-0.80	-0.016
1929			51.30	51.30	49.16	-1.66	-0.034
1930			50.00	50.00	47.13	-2.03	-0.043
1931			45.60	45.60	45.43	-1.70	-0.037
1932			40.90	40.90	43.97	-1.46	-0.033
1933			38.80	38.80	42.57	-1.40	-0.033
1934			40.10	40.10	41.57	-1.00	-0.024
1935			41.10	41.10	41.11	-0.46	-0.011
1936			41.50	41.50	41.21	0.10	0.002
1937			43.00	43.00	41.67	0.46	0.011
1938			42.40	42.40	42.24	0.57	0.014
1939			41.60	41.60	43.34	1.10	0.025
1940			42.00	42.00	44.81	1.47	0.033
1941			44.10	44.10	46.20	1.39	0.030
1942			48.80	48.80	47.84	1.64	0.034
1943			51.80	51.80	50.26	2.41	0.048
1944			52.70	52.70	53.81	3.56	0.066
1945			53.90	53.90	57.81	4.00	0.069
1946			58.50	58.50	61.04	3.23	0.053
1947			66.90	66.90	63.94	2.90	0.045
1948			72.10	72.10	67.53	3.59	0.053
1949			71.40	71.40	71.19	3.66	0.051
1950			72.10	72.10	74.27	3.09	0.042
1951			77.80	77.80	76.21	1.94	0.025
1952			79.50	79.50	77.37	1.16	0.015
1953			80.10	80.10	78.80	1.43	0.018
1954			80.50	80.50	80.54	1.74	0.022
1955			80.20	80.20	81.80	1.26	0.015
1956			81.40	81.40	82.91	1.11	0.013
1957			84.30	84.30	84.14	1.23	0.015
1958			86.60	86.60	85.44	1.30	0.015
1959			87.30	87.30	86.93	1.49	0.017
1960	29.60	2.99	88.70	88.70	88.40	1.47	0.017
1961	29.90	2.99	89.60	89.60	89.63	1.23	0.014
1962	30.20	3.00	90.60	90.60	90.76	1.13	0.012
1963	30.60	2.99	91.70	91.70	92.17	1.41	0.015
1964	31.00	2.99	92.90	92.90	93.79	1.61	0.017
1965	31.50	3.00	94.50	94.50	95.87	2.09	0.022
1966	32.40	3.00	97.20	97.20	98.61	2.74	0.028
1967	33.40	2.99	100.00	100.00	102.13	3.51	0.034
1968	34.80	2.99	104.20	104.20	106.21	4.09	0.038
1969	36.70	2.99	109.80	109.80	110.63	4.41	0.040
1970	38.80	2.99	116.30	116.30	115.77	5.14	0.044
1971	40.50	3.00		121.50	122.61	6.84	0.056
1972	41.80	3.00		125.40	130.79	8.17	0.062
1973	44.40	3.00		133.20	139.49	8.70	0.062
1974	49.30	3.00		147.90	148.84	9.36	0.063
1975	53.80	3.00		161.40	159.43	10.59	0.066
1976	56.90	3.00		170.70	172.63	13.20	0.076
1977	60.60	3.00		181.80	188.91	16.29	0.086
1978	65.20	3.00		195.60	206.74	17.83	0.086
1979	72.60	3.00		217.80	225.04	18.30	0.081
1980	82.40	3.00		247.20	243.34	18.30	0.075
1981	90.90	3.00		272.70	261.90	18.56	0.071
1982	96.50	3.00		289.50	280.07	18.17	0.065
1983	99.50	3.00		298.80	295.93	15.86	0.054
1984	103.90	3.00		311.70	309.30	13.37	0.043
1985	107.60	3.00		322.80	321.04	11.74	0.037
1986	109.60	3.00		328.80	332.83	11.79	0.035
1987	113.60	3.00		340.80	346.16	13.33	0.039
1988	118.30	3.00		354.90	360.00	13.84	0.038
1989	124.00	3.00		372.00	374.01	14.01	0.037
1990	130.70	3.00		392.10	388.97	14.96	0.038
1991	136.20	3.00		408.60			
1992	140.30	3.00		420.90			
1993	144.50	3.00		433.50			

Appendix 5 - Inflation: Cumulative Averages.

		Col. 1		Col. 2		Col. 3		Col. 4		Col. 5	Col 6.
	Axis	Year		Year		Year		Year		Average %	Cumulative %
Revolution	1	1805	-0.63%	1861	8.60%	1917	10.50%	1973	6.24%	6.1765%	24.71%
	2	1806	1.25%	1862	8.30%	1918	7.53%	1974	6.29%	5.8409%	23.36%
	3	1807	0.62%	1863	6.59%	1919	5.97%	1975	6.64%	4.9539%	19.82%
	4	1808	1.52%	1864	5.49%	1920	5.25%	1976	7.65%	4.9799%	19.92%
	5	1809	1.80%	1865	4.55%	1921	3.53%	1977	8.62%	4.6222%	18.49%
	6	1810	3.19%	1866	3.38%	1922	2.00%	1978	8.62%	4.2970%	17.19%
	7	1811	5.22%	1867	0.34%	1923	0.32%	1979	8.13%	3.5028%	14.01%
Evolving	8	1812	1.89%	1868	-3.85%	1924	-2.20%	1980	7.52%	0.8402%	3.36%
Consolidation	9	1813	1.07%	1869	-3.62%	1925	-0.64%	1981	7.09%	0.9731%	3.89%
	10	1814	0.27%	1870	-2.99%	1926	0.30%	1982	6.49%	1.0181%	4.07%
	11	1815	-1.08%	1871	-3.08%	1927	-0.30%	1983	5.36%	0.2254%	0.90%
	12	1816	-1.36%	1872	-2.77%	1928	-1.57%	1984	4.32%	-0.3451%	-1.38%
	13	1817	-4.56%	1873	-3.27%	1929	-3.37%	1985	3.66%	-1.8843%	-7.54%
	14	1818	-7.01%	1874	-2.51%	1930	-4.30%	1986	3.54%	-2.5715%	-10.29%
	15	1819	-4.79%	1875	-3.02%	1931	-3.74%	1987	3.85%	-1.9253%	-7.70%
	16	1820	-5.03%	1876	-3.57%	1932	-3.31%	1988	3.85%	-2.0184%	-8.07%
	17	1821	-5.30%	1877	-3.23%	1933	-3.29%	1989	3.75%	-2.0169%	-8.07%
	18	1822	-4.43%	1878	-2.36%	1934	-2.41%	1990		-3.0640%	-9.19%
	19	1823	-4.63%	1879	-1.92%	1935	-1.11%	1991		-2.5561%	-7.67%
	20	1824	-3.19%	1880	-1.96%	1936	0.24%	1992		-1.6351%	-4.91%
	21	1825	-2.87%	1881	-2.51%	1937	1.10%	1993		-1.4281%	-4.28%
Consolidation	22	1826	-3.39%	1882	-1.02%	1938	1.35%	1994		-1.0174%	-3.05%
	23	1827	-1.72%	1883	-0.51%	1939	2.54%	1995		0.1012%	0.30%
	24	1828	-0.43%	1884	-1.03%	1940	3.28%	1996		0.6065%	1.82%
	25	1829	-1.76%	1885	-1.04%	1941	3.00%	1997		0.0652%	0.20%
	26	1830	-2.25%	1886	-1.05%	1942	3.43%	1998		0.0430%	0.13%
	27	1831	-1.83%	1887	-0.53%	1943	4.80%	1999		0.8133%	2.44%
	28	1832	-0.93%	1888	0.00%	1944	6.61%	2000		1.8947%	5.68%
	29	1833	0.46%	1889	0.00%	1945	6.92%	2001		2.4598%	7.38%
	30	1834	0.91%	1890	0.00%	1946	5.29%	2002		2.0674%	6.20%
	31	1835	0.00%	1891	-0.53%	1947	4.54%	2003		1.3345%	4.00%
	32	1836	0.90%	1892	-1.08%	1948	5.31%	2004		1.7132%	5.14%
	33	1837	0.45%	1893	-1.09%	1949	5.14%	2005		1.5003%	4.50%
	34	1838	0.45%	1894	-1.10%	1950	4.15%	2006		1.1681%	3.50%
	35	1839	-0.90%	1895	-1.11%	1951	2.55%	2007		0.1777%	0.53%
Evolving	36	1840	-2.31%	1896	-1.12%	1952	1.50%	2008		-0.6476%	-1.94%
Revolution	37	1841	-2.86%	1897	-1.14%	1953	1.81%	2009		-0.7269%	-2.18%
	38	1842	-1.94%	1898	-0.57%	1954	2.16%	2010		-0.1164%	-0.35%
	39	1843	-2.49%	1899	0.57%	1955	1.54%	2011		-0.1275%	-0.38%
	40	1844	-1.01%	1900	1.12%	1956	1.34%	2012		0.4875%	1.46%
	41	1845	-2.58%	1901	1.11%	1957	1.46%	2013		-0.0020%	-0.01%
	42	1846	-2.11%	1902	1.10%	1958	1.52%	2014		0.1717%	0.52%
	43	1847	-1.60%	1903	1.09%	1959	1.71%	2015		0.3973%	1.19%
	44	1848	-1.63%	1904	1.60%	1960	1.66%	2016		0.5461%	1.64%
	45	1849	-1.66%	1905	1.06%	1961	1.37%	2017		0.2572%	0.77%
	46	1850	-1.12%	1906	0.53%	1962	1.24%	2018		0.2175%	0.65%
	47	1851	-0.56%	1907	0.52%	1963	1.53%	2019		0.4987%	1.50%
	48	1852	1.11%	1908	0.52%	1964	1.72%	2020		1.1177%	3.35%
	49	1853	1.10%	1909	1.03%	1965	2.18%	2021		1.4351%	4.31%
Revolution	50	1854	1.62%	1910	1.37%	1966	2.78%	2022		1.9252%	5.78%
	51	1855	0.54%	1911	1.06%	1967	3.44%	2023		1.6783%	5.04%
	52	1856	1.06%	1912	1.68%	1968	3.85%	2024		2.1973%	6.59%
	53	1857	1.05%	1913	2.74%	1969	3.99%	2025		2.5948%	7.78%
	54	1858	0.00%	1914	4.76%	1970	4.44%	2026		3.0688%	9.21%
	55	1859	1.04%	1915	7.26%	1971	5.58%	2027		4.6289%	13.89%
	56	1860	4.95%	1916	8.83%	1972	6.25%	2028		6.6763%	20.03%

Appendix 7 - Spreadsheet.

APPENDIX 7

14 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

		1		2		3		4		5	
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000	1938	192.9000
	14	Est. *	23.1000	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000
	Ratio		1.8354978		1.4457547		1.959217		1.3780183		1.1655589
2	Year	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000	1939	209.4000
	14	1869	23.1000	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000
	Ratio		1.8354978		1.5825472		1.8360656		1.4561688		1.1672241
3	Year	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000	1940	227.2000
	14	1870	23.1000	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000
	Ratio		1.8354978		1.6179245		1.8979592		1.4592934		1.1957895
4	Year	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000	1941	263.7000
	14	1871	23.1000	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000
	Ratio		1.8354978		1.7641509		1.7566845		1.4452055		1.3886256
5	Year	1886	42.4000	1900	76.9000	1914	125.6000	1928	190.9000	1942	297.8000
	14	1872	23.1000	1886	42.4000	1900	76.9000	1914	125.6000	1928	190.9000
	Ratio		1.8354978		1.8136792		1.63329		1.5199045		1.559979
6	Year	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000	1943	337.1000
	14	1873	23.1000	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000
	Ratio		1.8354978		2.0212264		1.4527421		1.6353414		1.6556974
7	Year	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000	1944	361.3000
	14	1874	23.1000	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000
	Ratio		1.8354978		2.0400943		1.5537572		1.3653274		1.9689373
8	Year	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000	1945	355.2000
	14	1875	23.1000	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000
	Ratio		2.1255411		1.8492872		1.4889868		1.2522189		2.0980508
9	Year	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000	1946	312.6000
	14	1876	23.1000	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000
	Ratio		2.2813853		1.7020873		1.6923077		0.9499341		2.1678225
10	Year	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000	1947	309.9000
	14	1877	23.1000	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000
	Ratio		2.3852814		1.7477314		1.5202492		0.9665301		2.190106
11	Year	1892	60.4000	1906	107.5000	1920	140.0000	1934	154.3000	1948	323.7000
	14	1878	42.4000	1892	60.4000	1906	107.5000	1920	140.0000	1934	154.3000
	Ratio		1.4245283		1.7798013		1.3023256		1.1021429		2.0978613
12	Year	1893	57.5000	1907	109.2000	1921	127.8000	1935	169.5000	1949	324.1000
	14	1879	42.4000	1893	57.5000	1907	109.2000	1921	127.8000	1935	169.5000
	Ratio		1.3561321		1.8991304		1.1703297		1.3262911		1.9120944
13	Year	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000	1950	355.3000
	14	1880	42.4000	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000
	Ratio		1.3183962		1.7924866		1.4770459		1.3040541		1.8409326
14	Year	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000	1951	383.4000
	14	1881	42.4000	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000
	Ratio		1.4764151		1.8658147		1.4203767		1.2248342		1.886811
A	Maximum Ratio of Column		2.385281		2.040094		1.959217		1.635341		2.190106
B	Minimum Ratio of Column		1.318396		1.445755		1.170330		0.949934		1.165559
C	Spread		1.066885		0.594340		0.788887		0.685407		1.024547
D	Mid-Range Ratio of Column		1.851839		1.742925		1.564773		1.292638		1.677832
E	Median Ratio of Column		1.835498		1.779801		1.520249		1.326291		1.840933
F	Average Ratio of Column		1.801155		1.780123		1.582953		1.313233		1.735392

		6		7		8		9		10		A	B	C	D	E	F
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row
1	Year	1952	395.1000	1966	658.1000	1980	996.8309	1994	1514.3943	2008	2198.6295						
	14	1938	192.9000	1952	395.1000	1966	658.1000	1980	996.8309	1994	1514.3943						
	Ratio		2.0482115		1.66565426		1.51471038		1.51920882			2.048212	1.165559	0.882653	1.606885	1.516960	1.614648
2	Year	1953	412.8000	1967	675.2000	1981	1010.8394	1995	1546.7308	2009	2208.7984						
	14	1939	209.4000	1953	412.8000	1967	675.2000	1981	1010.8394	1995	1546.7308						
	Ratio		1.9713467		1.63565891		1.49709627		1.53014495			1.971347	1.167224	0.804123	1.569285	1.556346	1.612417
3	Year	1954	407.0000	1968	706.6000	1982	995.1411	1996	1615.0033								
	14	1940	227.2000	1954	407.0000	1968	706.6000	1982	995.1411								
	Ratio		1.7913732		1.73611794		1.4083514		1.62288875			1.897959	1.195789	0.702170	1.546874	1.620407	1.618355
4	Year	1955	438.0000	1969	725.6000	1983	1072.5727	1997	1681.8760								
	14	1941	263.7000	1955	438.0000	1969	725.6000	1983	1072.5727								
	Ratio		1.6609784		1.656621		1.47818729		1.56807646			1.835498	1.388626	0.446872	1.612062	1.612349	1.617114
5	Year	1956	446.1000	1970	722.5000	1984	1129.4464	1998	1764.5370								
	14	1942	297.8000	1956	446.1000	1970	722.5000	1984	1129.4464								
	Ratio		1.4979852		1.61959202		1.56324761		1.56230256			1.835498	1.497985	0.337513	1.666742	1.562775	1.622831
6	Year	1957	452.5000	1971	751.2051	1985	1174.0716	1999	1854.0672								
	14	1943	337.1000	1957	452.5000	1971	751.2051	1985	1174.0716								
	Ratio		1.3423317		1.66012177		1.5629175		1.57917728			2.021226	1.342332	0.678895	1.681779	1.607259	1.638339
7	Year	1958	447.3000	1972	803.4814	1986	1203.2684	2000	1911.3209								
	14	1944	361.3000	1958	447.3000	1972	803.4814	1986	1203.2684								
	Ratio		1.2380293		1.79629197		1.49756846		1.58844103			2.040094	1.238029	0.802065	1.639062	1.571099	1.653772
8	Year	1959	475.9000	1973	839.4182	1987	1256.1826	2001	1925.1794								
	14	1945	355.2000	1959	475.9000	1973	839.4182	1987	1256.1826								
	Ratio		1.3398086		1.76385417		1.49649198		1.53256334			2.125541	1.252219	0.873322	1.688880	1.514528	1.660756
9	Year	1960	487.7000	1974	821.7401	1988	1303.1774	2002	1957.1959								
	14	1946	312.6000	1960	487.7000	1974	821.7401	1988	1303.1774								
	Ratio		1.5601408		1.68492946		1.58587539		1.50186452			2.281385	0.949934	1.331451	1.615660	1.635402	1.680705
10	Year	1961	497.2000	1975	843.0778	1989	1340.0434	2003	2036.0677								
	14	1947	309.9000	1961	497.2000	1975	843.0778	1989	1340.0434								
	Ratio		1.6043885		1.69565125		1.58946588		1.5194043			2.385281	0.966530	1.418751	1.675906	1.596927	1.690979
11	Year	1962	529.5000	1976	879.3138	1990	1351.3622	2004	2093.6810								
	14	1948	323.7000	1962	529.5000	1976	879.3138	1990	1351.3622								
	Ratio		1.6357739		1.66064929		1.53683725		1.5493115			2.097861	1.102143	0.995718	1.600002	1.592543	1.565470
12	Year	1963	551.0000	1977	922.6690	1991	1360.3512	2005	2151.0247								
	14	1949	324.1000	1963	551.0000	1977	922.6690	1991	1360.3512								
	Ratio		1.7000926		1.67453539		1.47436535		1.58122748			1.912094	1.170330	0.741765	1.541212	1.627881	1.566022
13	Year	1964	581.1000	1978	985.8821	1992	1418.0149	2006	2201.9891								
	14	1950	355.3000	1964	581.1000	1978	985.8821	1992	1418.0149								
	Ratio		1.6355193		1.69657907		1.43832097		1.55286739			1.840933	1.304054	0.536879	1.572493	1.594193	1.561800
14	Year	1965	617.8000	1979	1001.7304	1993	1454.1409	2007	2272.2615								
	14	1951	383.4000	1965	617.8000	1979	1001.7304	1993	1454.1409								
	Ratio		1.6113719		1.62144772		1.451629		1.56261439			1.886811	1.224834	0.661977	1.555823	1.586993	1.569035
A	Maximum Ratio of Column		2.048212		1.796292		1.589466		1.622889								
B	Minimum Ratio of Column		1.238029		1.619592		1.408351		1.501865								
C	Spread		0.810182		0.176700		0.181114		0.121024								
D	Mid-Range Ratio of Column		1.643120		1.707942		1.498909		1.562377								
E	Median Ratio of Column		1.635519		1.665654		1.497096		1.552867								
F	Average Ratio of Column		1.616954		1.683407		1.506790		1.555007								

Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Mid-Range + Average/2	Median + Average/2
1.690979	1.561800	1.626389	1.617735	1.619446	1.622918	1.618590

Max. of F - Columns	Min. of F - Columns	Mid-Range of F - Columns	Median of F - Columns	Avg. of F - Columns	Mid-Range + Average/2	Median + Average/2
1.801155	1.313233	1.557194	1.616954	1.619446	1.588320	1.618200

	Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Mid-Range + Average/2	Median + Average/2
Circle Analysis	1.690979	1.561800	1.626389	1.617735	1.619446	1.622918	1.618590
Square Analysis	1.690979	1.561800	1.626389	1.617114	1.619126	1.622758	1.618120

Est. * The data for 1868, 23.10, has been taken from the estimate given in the Historical Abstract for the years 1869 - 1877. This enables Column 1, 1882 - 1895, to be added into the graph with the minimum of difficulty in figuring averages for both rows and columns. This amount is repeated throughout the period, 1869 - 1877, and appears to represent a reasonable estimate for the Real GNP of 1868

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