Of Jane Austen and the secret life of econometric quantities, or as otherwise entitled on Okun's Law and the 'multiplicative inverse surprise'

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Of Jane Austen and the Secret Life of Econometric Quantities

or, as otherwise entitled:

On Okun's Law and "the Multiplicative Inverse Surprise"

By Scott A. Albers*

For Emma Thompson

Abstract: *This article proposes that Okun's Law is an empirical relationship between employment and production which, in the United States, correlates to the relationship between the radius of a circle and one-half of its circumference i.e. numerically, the ratio 1 : π.. This requires two new sets of numbers, these being the set of feminine numbers (0<F<1) and their inverses in the set of masculine numbers (1<M), as well as the invention of the "Jane Austen Multiplicative Inverse." Data describing Okun's Law appears to confirm the reliability of this approach with an accuracy of up to 1.05 parts in 100,000.*[1],[2]

Introduction

> But Elinor — how are HER feelings to be described? — From the moment of learning that Lucy was married to another, that Edward was free, to the moment of his justifying the hopes which had so instantly followed, she was every thing by turns but tranquil.
>
> Jane Austen, *Sense and Sensibility*

Emma Thompson is a well-known actress of stage and screen, winning the 1995 Academy Award for Best Adapted Screenplay and the 1995 Golden Globe Award for Best Supporting Actress in her performance as Miss Elinor Dashwood, the stalwart and sensitive heroine of Jane Austen's 1811 novel *Sense and Sensibility*. One of the most memorable scenes of this film was Ms. Thompson's engaging portrayal of Miss Dashwood's relief unto tears on learning that Mr. Edward Ferrars was *not* married.

From this simple association arose the idea of a "Jane Austen Multiplicative Inverse," a pedagogic device presented here as nothing more than hopefully helpful. Miss Thompson's admirable portrayal of intelligent, thoughtful and independent women in the films *Henry V*, *Much Ado About Nothing*, *Last Chance Charlie* and *Sense and Sensibility* have led me to hope

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1 This article contains 4,612 words, with an abstract of 99 words. Additional papers toward an understanding of the ideas presented herein is found at "scribd_scott_albers_1" and the Munich Personal Repository.

2 Acknowledgements. This reply to Dr. Edward Knotek's rhetorical question "How Useful is Okun's Law?" (Economic Review 2007) is possible only because he has been so generous with his time, his valuable information, his insights as to Okun's Law and his repeated explanations of data and methods which he used in that article.

that she will not object to her name being associated with a mathematics using a feminine analogy, not unlike the "male" and "female" aspects of electrical circuits. This essay is composed stylistically along the lines of Ms. Thompson's speech at the Golden Globes ceremony which perhaps the reader may find, if not as talented her own, at least worthy of an American.

With this introduction I proceed by requesting that the reader concede a single, fundamental point, and it is this: *All macroeconomic quantification relies first upon the theory of numbers.* I maintain that this point is at the very essence of mathematical economics.

The Realm

Should one tour the terrain of number theory for any even brief period of time one must admit that the denizens of that kingdom are decidedly Victorian in disposition. Nowhere is this tendency more evident than in the theory of the multiplicative inverse.

Where else in all the civilized world of thought does the subjected and meek "Miss ½" marry forever the redoubtable and dependable "Mr. 2" and emerge through all time and eternity as the complete inverse couplet: "1/2 x 2 = 1"? In a fashion worthy of Jane Austen herself the feminine numbers ($0 < F < 1$) find their multiplicative inverses in the masculine numbers ($1 < M$) and through simple association verging on osmosis render the theoretic, nay required, association 1/x x x/1 = 1. A proposition of this sort found in Nature Herself is hard to imagine, and yet we all feel that such is, or at least should be, so the case.

But what of the eccentric and even erratic "Mr. 6.28..." and the fluttering heart of "Miss 1/2" when he draws nigh? Does it not occur to even the most pedantic among us that, through a once-upon-a-time and probably – even 'likely' – illicit conjoining of the two emerged the creation of "Mr. π" himself in all his wild, dissolute and raven-haired *gloire*? Here let us begin our tale of the secret heart and life of numbers and the macro-econometric quantities which they convey, their quiet joys and their surprises.

The Women of the Realm

First be it mentioned in what must inevitably pose a strange and dark quest that an inverse may be created for any feminine ($0<F<1$) number by the simple expedient of reversing in numerator and denominator her own character. In this sense every $1/x = F$ must and always will have some number $x/1 = M$ to whom she can cling, attach and render the complete couplet:

$$\boxed{\frac{1}{x} \times \frac{x}{1} = 1}$$

... to which her fancies and thoughts so inevitably tend.

Here let the word "Progenic" be introduced, as referring to the product of the above association of feminine and masculine numbers. By "progenic" ("P" as taken from the root word "progeny" signifying "child" or "children") I mean the number which is derived from two other numbers *as an intended result*, as contrasted with a number which appears in the data through statistical chance.

For beyond this simple number "1" are the distant imaginings of other things, all of which are themselves also "progenic" yet as far unlike "1" as sea is to shore. In this fashion, using "1" as the fulcrum of her desire, every feminine number may create a "Jane Austen multiplicative inverse" by simply permitting herself the chance. While such combinations may be dismally sanctioned by the best society, they have not as yet been scandalized successfully out of existence.

For example, should a "Jane Austen multiplicative inverse" be derived for the number ½ about the projenic number π, she need only to calculate the likely quantity of $2/1 \times \pi = 6.28...$, and through her own multiplicative effort as conjoining to this number, render the subsequent progenic π as follows:

$$\frac{1}{2} \longrightarrow \pi$$

$$\pi \times \frac{2}{1} = 2\pi$$

$$\frac{1}{2} \times 2\pi = \pi$$

And so I lay it down in bold: a *proper* multiplicative inverse has as its progenic product the number "1," and a *Jane Austen* multiplicative inverse has as its progenic product some number greater than 1, some "P," implying thereby the existence of some masculine father as determined to be always at some multiple greater than x/1.

The *gravitas* of the question is obvious.

Let us consider the simple process whereby a Jane Austen multiplicative inverse may be procured for the number 1/46 about the projenic number phi = 1.6180... We would use the following straight-forward calculus:

$$\frac{1}{46} \longrightarrow \varphi$$

$$\varphi \times \frac{46}{1} = 46\varphi$$

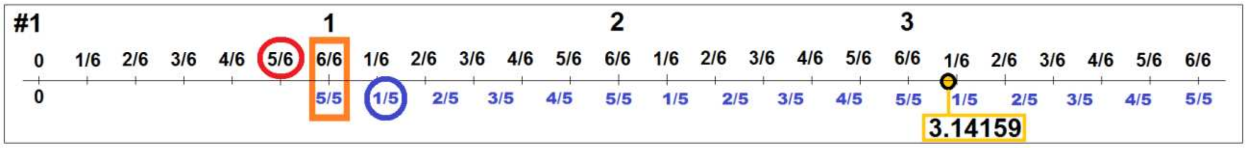
$$\frac{1}{46} \times 46\varphi = \varphi$$

This of course does not diminish in the least the culpability of the affair, nor should it properly challenge the loyalty of 1/46 x 46/1 = 1. It merely serves to show that a world of longing exists in even the purest heart of number theory, one as irrevocable as The Dawn.

There are of course corollaries to this situation and not all feminine numbers are of the straight-forward 1/2, 1/3, 1/4, 1/5, 1/6, etc. sort. Nevertheless a more intractable feminine number, say "Miss 5/6," has but to reverse the numerator and denominator of her own character and straight-away "Mr. 6/5" shall appear, to render the equation complete (see #1, below):

$$\frac{5}{6} \times \frac{6}{5} = 1$$

As this might be placed on a number line, we have:



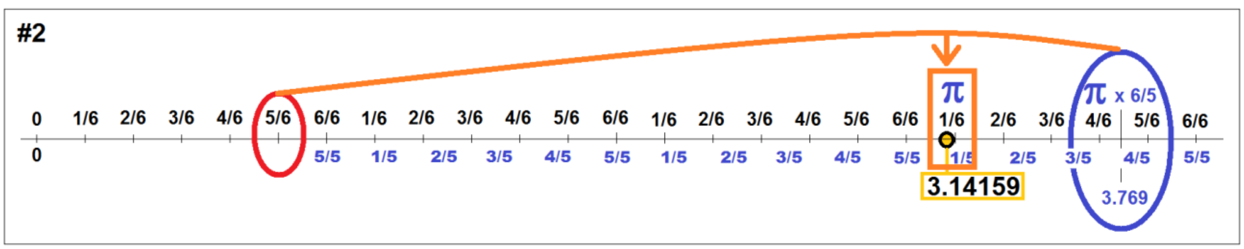
Because it will be quite important at a later point in this story, we might consider the manner in which "Miss 5/6" might aspire to the progenic number "Mr. π" as a matter of some strategy. Multiplying π x 6/5 yields the following (see #2, below):

$$\frac{5}{6} \longrightarrow \pi$$

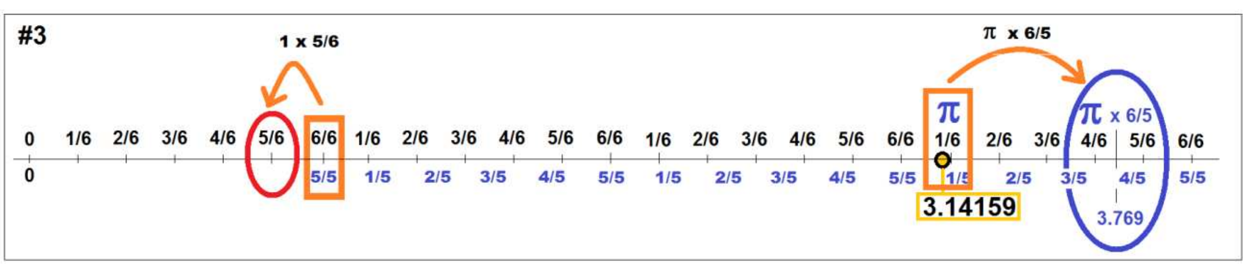
$$\pi \times \frac{6}{5} = \frac{6}{5}\pi$$

$$\frac{5}{6} \times \frac{6}{5}\pi = \pi$$

Or stated in the context of a number line:



In this day and age of relativistic considerations one might inquire as to how this all looks from the point of view of the egocentric and generally clueless progeny of "Miss 5/6" and her secret lover, the mysterious "Mr. 6 π / 5". Because the projenic number "Mr. π" is as yet without mate or prospect, only the numbers 1 and π exist for him. As depicted below, from his point of view his mother, the feminine "Miss 5/6," simply counts for "5/6 x 1," representing his own egotism multiplied by what he sees in her. Conversely his father represents "6/5 x himself." (see #3, below):



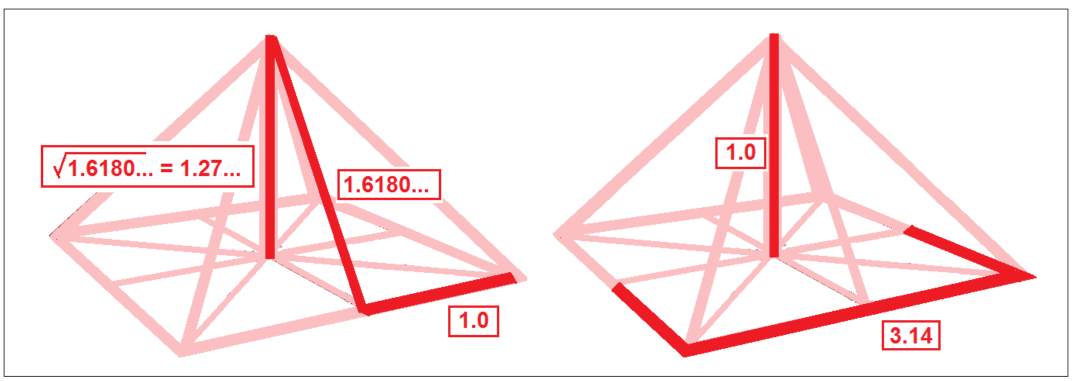
The fact that this relationship might be expressed in decimals rather than fractions does not alter the situation in the least, however modern it might appear at first. Nevertheless the translation of one set of ideas into a basically foreign set of ideas is not without its problems. In any event the following example, using decimals, is equivalent for the purposes of this commentary on the heart of logic, to wit:

$$0.8333... \quad x \quad 1.2 \quad = 1$$

But, says the macro-economist, what has this to do with me, or with the proper function of my trade in calculating macro-economic quantities of any sort? To this answer turn we now.

The Egyptian Affair

Once in Egypt, not far from the ancient and exotic city of Cairo, known to the Arabs as "the Vanquisher" and "the city of a thousand minarets," an enormous sculpture was raised upon the Giza Plateau, the Great Pyramid and its set of consorting pyramids, the word itself meaning in Greek "fire in the center." And through all the years hence the mathematical properties of this figure have guided scientists, mystics and the common spectator tourist alike to a healthy admiration of the capacities of others not themselves. Among the properties of the greatest of these pyramids we find both π (= 3.14159...) and φ (= 1.61803...) as the two closest of companions, as follows:



The significance of this monument of 2.3 million 100-ton blocks of solid stone, built for reasons unknown, has struck and eluded all who have taken the time to wonder the purpose of its existence, coming to represent impenetrable yet wondrous mystery incarnate.[3]

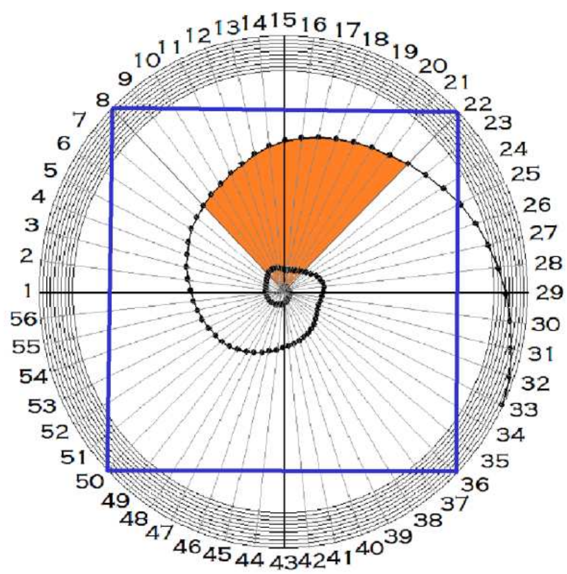
[3] As to the incorporation of pi into the design see Tompkins (1971:70) "Taylor then discovered that if he divided the perimeter of the Pyramid by twice its height, it gave him a quotient of 3.144, remarkably close to the value of pi, which is computed as 3.14159+. In other words, the height of the Pyramid appeared to be in relation to the perimeter of its base as the radius of a circle is to its circumference." In accord see DeSalvo (2008:72-73), Skinner (2006:116-119), Dunn, (1998:59).

As to phi see Tompkins (1971:190) "(T)he Pyramid was designed to incorporate not only the pi proportion by another and even more useful constant proportion, known in the Renaissance as the Golden Section, designated in modern times by the Greek letter φ (pronounced phi) or 1.618. (If the 356 cubits of the Pyramid's apothem are divided by half the base of 220 cubits, the result is 89/55, or 1.618.)" In accord see Skinner (2006: 119-121), Hemenway (2005:68).

In has been shown that the central quantitative fixture of the economy of the United States is the proportion 1:φ, as fully revealed in the following diagram and its explicating essay. (Albers & Albers, 2013) In fine, over the course of 14 years the real GNP of the United States increases on average in a 1 : 1.6180 ratio. The biologic, mystical, natural, mathematic, etc. associations, benign and otherwise, brought forward by this unexpected yet quite quantifiable fact are yet to be explored fully.

DIAGRAM 4-7. THE "GNP SPIRAL"

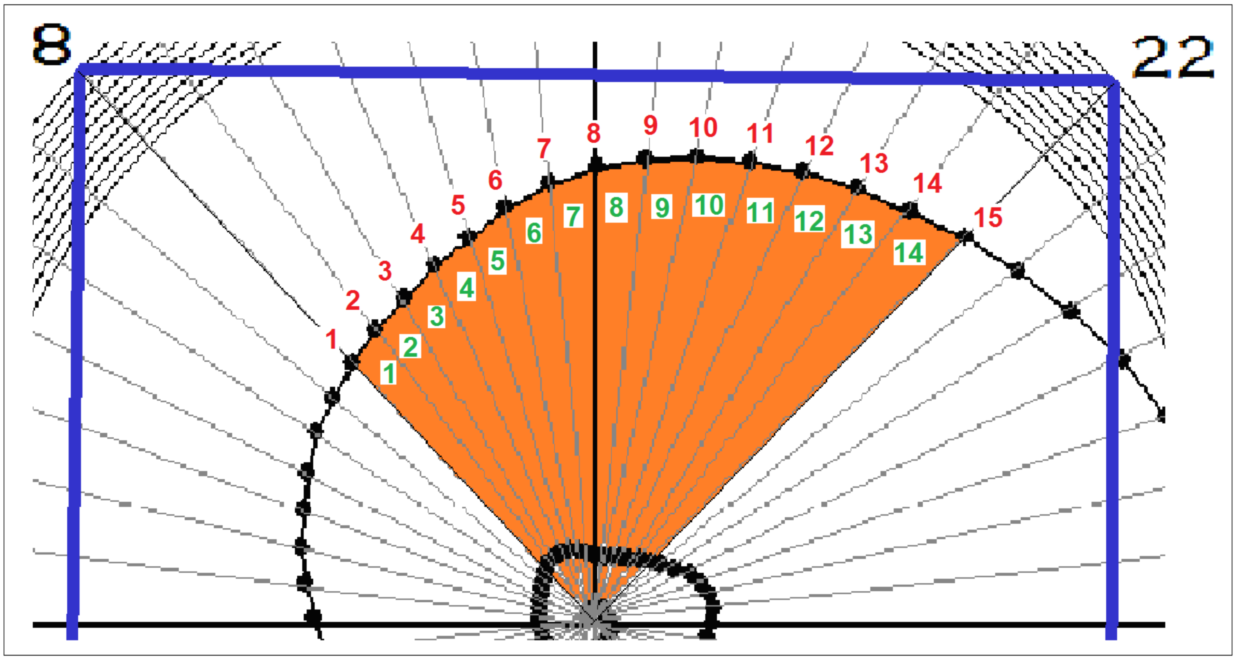
	Date	Date	Date	Date	Date	Date
14	1762	1818	1874	1930	1986	
13	1761	1817	1873	1929	1985	
12	1760	1816	1872	1928	1984	
11	1769	1815	1871	1927	1983	
10	1768	1814	1870	1926	1982	
9	1767	1813	1869	1925	1981	
8	1766	1812	1868	1924	1980	2036
7	1765	1811	1867	1923	1979	2035
6	1764	1810	1866	1922	1978	2034
5	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

The above spiral, which mimics the spiral of galaxies and shellfish alike, brings forward numerous questions as to the nature of time in social systems. Here let us note that one of these aspects is that the running of a period of time, like the running of a race, suggests both masculine and feminine numbers.

In some apparent opposition to both see Livio, (2002:53-61). Calculating a difference from phi at "less than 0.1%" (at 56) and "differing (from pi) only by about 0.05%" (at 58), he argues that these proportions are not those of an original design by the builder of the Great Pyramid. "(I)t is highly unlikely that either the ancient Babylonians or the ancient Egyptians discovered the Golden Ratio and its properties; this task was left for the Greek mathematicians." (at 61)



In so far as the race begins with a starting line and ends with a finish line, then the number of lines counted will be one more than the spaces held between the lines. In the above case highlighted in orange we count 15 lines creating 14 spaces. The fourteen spaces themselves contain a specific number days. To begin the count of days we start at the first day, indicating the starting line of the race. It is, however, the second line, not the first, which represents the end of the first year.

Consequently the period of time might be measured in feminine numbers as 14/15 (counting the time held within the boundaries).

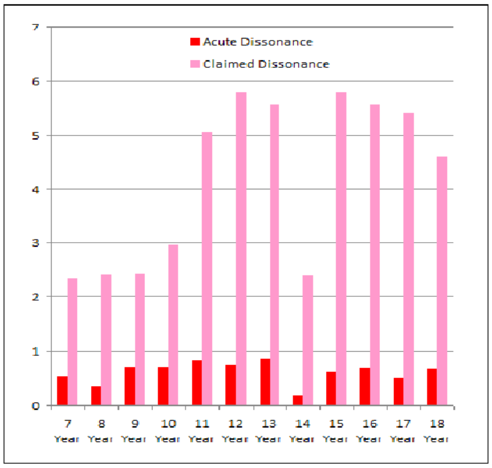
Conversely we may consider the same period as stated in masculine numbers at its inverse, 15/14 (counting the number of boundaries holding the time period).

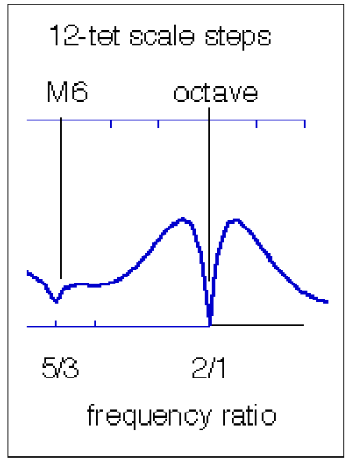
The two sets of numbers will equal “one” if multiplied together in a proper inverse. But if a Jane Austen multiplicative inverse is intended, the result may be considerably different.

The spiral itself is based upon an harmonic interpretation of the Kondratiev Wave, an historic “Long Wave” of political-economy of precisely 56 years in duration, an interpretation which hails from no less of a figure in mathematics than Pythagoras himself. Through the distinct similarity which ratios of U.S. real GNP using various “spreads of years” have with octaves of musical harmony, one may determine “octaves” of mathematic association within the economic data itself, falling at spreads of 14 years. This is consonant with the onset of reproductive capabilities within the American citizenry; moreover it presents associations of both economics as well as politics.

Using the above model – "the GNP Spiral" – repetitions of constitutional amendment in the lower left quadrant stand at a 18 liberal : 3 conservative ratio in relation to the upper right quadrant. Moreover the Golden Mean and its association with φ = 1.6180... is stated to within 3.4 parts of 10,000 – and under even more exacting analysis at 5.3 parts of 100,000 – with an explained steady-state rate of growth between 3.496 and 3.499 percent annually.

DIAGRAM 3.11.
"ACUTE DISSONANCE" AND "CLAIMED DISSONANCE" WITH MUSICAL OCTAVE





- RED	+ RED		Acute Dissonance	Claimed Dissonance
0	0.539222	7 Year	0.53922225	2.33166
0	0.328323	8 Year	0.32832275	2.39980
0	0.71348	9 Year	0.713480444	2.41405
0	0.702555	10 Year	0.702555	2.95466
-0.82882	0	11 Year	0.828815273	5.05443
-0.07077	0.680828	12 Year	0.751594667	5.77002
-0.07244	0.789312	13 Year	0.861753846	5.55129
-0.01764	0.134157	14 Year	0.151795	2.39229
-0.28313	0.338373	15 Year	0.6214992	5.77038
-0.16258	0.526958	16 Year	0.689539375	5.54327
-0.10785	0.394316	17 Year	0.502165176	5.40061
-0.04362	0.624485	18 Year	0.668103333	4.58002

If an association exists between the economy of the United States and the Great Pyramid through their mutual apparent interest in the Golden Mean and its 1: φ ratio, then one must inquire whether there might be also a further fixed association with the ratio 1 : π, a mathematical relationship which must occur if truth be as interesting as fiction.

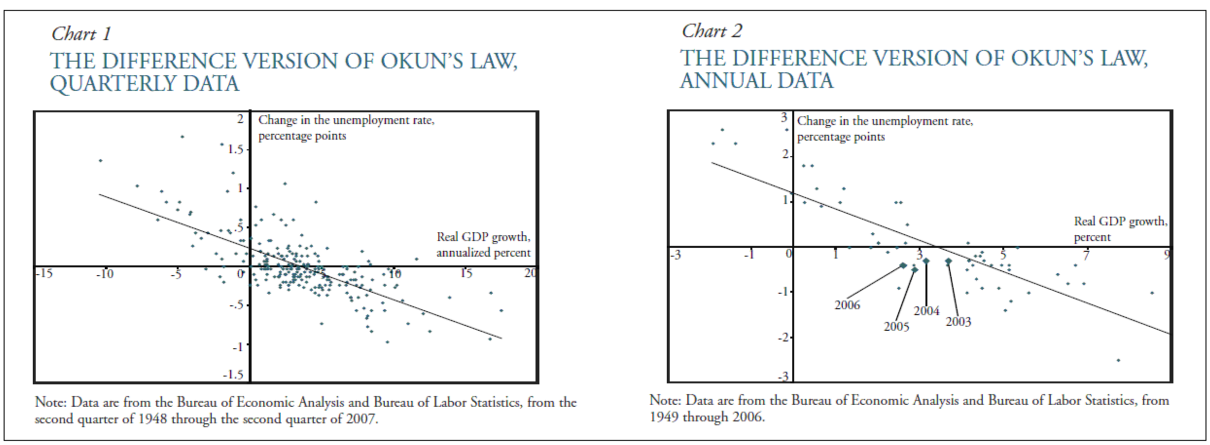
And so it is with mingled suspicion and suspense that one reads that in 1962 the august Arthur Okun discovered "Okun's Law," a clear, fixed and unexplained 3:1 relationship between a percentage increase in GNP production and percentage increase in the rate of employment. Might this 3:1 proportion be, in reality, a π:1 proportion?, thereby rendering unto the economists and the economy of the United States the infinite heaven-ward of impossibility?

Stated specifically, "Okun's Law" notes that for every three percentage points of increase in real GNP the rate of employment increases by one percentage point, and that decreases of both take place at the same rate.[1] This 3 : 1 proportion is generally referred to using a double negative, i.e. an increase of three percent in real GNP will lead to a one percent *decrease* in the rate of *un*employment. Although first stated by Arthur Okun, at the time senior economist of President Kennedy's Council of Economic Advisors, Okun's Law has taken on a legend of its own, being termed "one of the most reliable empirical regularities in macroeconomics."[1] (Tobin, 1983)

Dr. Edward Knotek's article "How Useful Is Okun's Law?" (Kansas City Federal Reserve *Economic Review*, 2007, in the public domain) proposes that Okun's Law is, at best, a helpful rule of thumb. As the title of the article suggests directly, Dr. Knotek describes in detail our present understanding of Okun's Law as both a mathematic equation and as a policy tool.

To make the point of his article Dr. Knotek organizes data sets which follow mainstream econometric methods as applied to well-known and easily available federal data bases covering a 60 year period of American economic history, i.e. the second quarter of 1947 through the third quarter of 2007. Charts One and Two graph the quarterly and annual data sets supporting the regularity of the relationship between changes in the size of real GNP (x-axis) and the corresponding effect this has on the rate of employment (y-axis).

DIAGRAM 2-2.
CHARTS ONE AND TWO OF "HOW USEFUL IS OKUN'S LAW?"



The following two emails provide Dr. Knotek's data sets for the annualized quarterly calculation (Chart One) and annual calculation (Chart Two) of Okun's Law.

Knotek's Quarterly Data, Email of November 30, 2011

Quarterly Figure		
	dy	du_avg
1948.2	7.242819	-0.06667
1948.3	2.33069	0.1
1948.4	0.946452	0.066667
1949.1	-5.8502	0.833333
1949.2	-1.17043	1.2
1949.3	4.571555	0.833333
1949.4	-4.01886	0.266667
1950.1	17.45697	-0.56667
1950.2	12.44685	-0.83333
1950.3	16.62782	-0.93333
1950.4	7.493361	-0.4
1951.1	4.934907	-0.73333
1951.2	6.972653	-0.4
1951.3	8.229388	0.066667
1951.4	0.681763	0.2
1952.1	4.241951	-0.3
1952.2	0.264934	-0.1
1952.3	2.629817	0.266667
1952.4	13.80097	-0.4
1953.1	7.75058	-0.13333
1953.2	3.069825	-0.13333
1953.3	-2.39934	0.166667
1953.4	-6.16277	0.966667
1954.1	-1.95385	1.566667
1954.2	0.372631	0.533333
1954.3	4.495923	0.166667
1954.4	8.153291	-0.63333
1955.1	12.02633	-0.6
1955.2	6.710869	-0.33333
1955.3	5.443469	-0.3
1955.4	2.148374	0.133333
1956.1	-1.85749	-0.2
1956.2	3.205905	0.166667
1956.3	-0.47861	-0.06667
1956.4	6.686428	-1E-15
1957.1	2.436114	-0.2
1957.2	-0.9875	0.166667
1957.3	3.962372	0.133333
1957.4	-4.16299	0.7
1958.1	-10.4351	1.366667
1958.2	2.388603	1.066667
1958.3	9.560821	-0.03333
1958.4	9.524235	-0.96667
1959.1	7.871279	-0.53333
1959.2	10.93633	-0.73333
1959.3	-0.30911	0.166667
1959.4	1.42571	0.333333
1960.1	9.202709	-0.46667
1960.2	-1.98708	0.1
1960.3	0.62426	0.3
1960.4	-5.08214	0.733333
1961.1	2.445174	0.533333
1961.2	7.728866	0.2
1961.3	6.636591	-0.23333
1961.4	8.42734	-0.56667
1962.1	7.385135	-0.56667
1962.2	4.446892	-0.1
1962.3	3.728473	0.033333
1962.4	0.984111	-0.03333
1963.1	5.344779	0.233333
1963.2	5.094721	-0.03333
1963.3	7.743873	-0.23333
1963.4	3.151647	0.066667
1964.1	9.274181	-0.1
1964.2	4.731776	-0.26667
1964.3	5.56688	-0.2
1964.4	1.075206	-0.03333
1965.1	10.20532	-0.06667
1965.2	5.515603	-0.23333
1965.3	8.364001	-0.3
1965.4	10.02623	-0.26667
1966.1	10.14659	-0.23333
1966.2	1.395016	-0.03333
1966.3	2.662104	-0.06667
1966.4	3.256599	-0.06667
1967.1	3.588677	0.133333
1967.2	0.023096	0
1967.3	3.213253	-0.03333
1967.4	3.058699	0.1
1968.1	8.501162	-0.16667
1968.2	6.958747	-0.16667
1968.3	2.755597	-0.03333
1968.4	1.697081	-0.13333
1969.1	6.456197	0
1969.2	1.146166	0.033333
1969.3	2.501255	0.133333
1969.4	-1.8787	0
1970.1	-0.66741	0.6
1970.2	0.757461	0.6
1970.3	3.59394	0.4
1970.4	-4.21533	0.666667
1971.1	11.56667	0.1
1971.2	2.275839	-0.03333
1971.3	3.20833	0.133333
1971.4	1.148736	-0.1
1972.1	7.299849	-0.16667
1972.2	9.78529	-0.06667
1972.3	3.86707	-0.13333
1972.4	6.707894	-0.2
1973.1	10.54887	-0.43333
1973.2	4.707755	0
1973.3	-2.11387	-0.13333
1973.4	3.877955	-0.03333
1974.1	-3.42169	0.366667
1974.2	1.158294	0.066667
1974.3	-3.81724	0.433333
1974.4	-1.56076	0.966667
1975.1	-4.69929	1.666667
1975.2	2.958451	0.6
1975.3	6.949137	-0.4
1975.4	5.347146	-0.16667
1976.1	9.313145	-0.56667
1976.2	3.013362	-0.16667
1976.3	1.929798	0.166667
1976.4	2.895596	0.033333
1977.1	4.921894	-0.26667
1977.2	8.087778	-0.36667
1977.3	7.355737	-0.23333
1977.4	-0.04152	-0.23333
1978.1	1.293793	-0.33333
1978.2	16.7223	-0.33333
1978.3	4.001975	0.033333
1978.4	5.366331	-0.13333
1979.1	0.78088	-0.03333
1979.2	0.381319	-0.16667
1979.3	2.911526	0.166667
1979.4	1.184553	0.1
1980.1	1.281886	0.333333
1980.2	-7.83339	1.033333
1980.3	-0.66294	0.333333
1980.4	7.625528	-0.26667
1981.1	8.354069	0.033333
1981.2	-3.0838	-0.03333
1981.3	4.926997	2E-15
1981.4	-4.89095	0.833333
1982.1	-6.39895	0.6
1982.2	2.165284	0.6
1982.3	-1.50538	0.466667
1982.4	0.355329	0.766667
1983.1	5.02475	-0.3
1983.2	9.331896	-0.23333
1983.3	8.136903	-0.76667
1983.4	8.439536	-0.83333
1984.1	8.052759	-0.66667
1984.2	7.064234	-0.43333
1984.3	3.94821	0
1984.4	3.327199	-0.13333
1985.1	3.744883	-0.06667
1985.2	3.461942	0.066667
1985.3	6.399978	-0.1
1985.4	3.110183	-0.16667
1986.1	3.880484	0
1986.2	1.594653	0.133333
1986.3	3.887249	-0.2
1986.4	2.030636	-0.13333
1987.1	2.657578	-0.23333
1987.2	4.47216	-0.33333
1987.3	3.679865	-0.26667
1987.4	7.170687	-0.16667
1988.1	1.969949	-0.13333
1988.2	5.182817	-0.23333
1988.3	2.152959	0
1988.4	5.383985	-0.13333
1989.1	4.121433	-0.13333
1989.2	2.650951	0.033333
1989.3	2.879728	0
1989.4	1.019115	0.133333
1990.1	4.700254	-0.06667
1990.2	1.027544	0.033333
1990.3	0.028052	0.366667
1990.4	-2.9894	0.433333
1991.1	-2.02488	0.466667
1991.2	2.621683	0.233333
1991.3	1.944451	0.033333
1991.4	1.889462	0.233333
1992.1	4.207894	0.266667
1992.2	3.913265	0.233333
1992.3	3.982549	0.033333
1992.4	4.480734	-0.26667
1993.1	0.484052	-0.23333
1993.2	2.042349	-0.06667
1993.3	2.069893	-0.26667
1993.4	5.491772	-0.16667
1994.1	4.131972	-0.06667
1994.2	5.31865	-0.36667
1994.3	2.260556	-0.2
1994.4	4.770358	-0.36667
1995.1	1.116369	-0.16667
1995.2	0.71929	0.2
1995.3	3.299958	0
1995.4	2.957835	-0.1
1996.1	2.850486	-0.03333
1996.2	6.719298	-0.03333
1996.3	3.39536	-0.23333
1996.4	4.759779	0.066667
1997.1	3.129113	-0.1
1997.2	6.217645	-0.23333
1997.3	5.074293	-0.13333
1997.4	2.982514	-0.2
1998.1	4.500149	-0.03333
1998.2	2.671779	-0.23333
1998.3	4.68705	0.133333
1998.4	6.215284	-0.1
1999.1	3.438473	-0.13333
1999.2	3.351939	-0.03333
1999.3	4.749838	-0.03333
1999.4	7.301756	-0.16667
2000.1	1.017186	-0.03333
2000.2	6.432867	-0.1
2000.3	-0.45819	0.066667
2000.4	2.094202	-0.1
2001.1	-0.4886	0.333333
2001.2	1.232927	0.166667
2001.3	-1.39784	0.433333
2001.4	1.585661	0.666667
2002.1	2.744245	0.2
2002.2	2.194778	0.133333
2002.3	2.37746	-0.1
2002.4	0.20232	0.133333
2003.1	1.201917	0
2003.2	3.469084	0.266667
2003.3	7.486494	0
2003.4	2.653249	-0.3
2004.1	2.959586	-0.13333
2004.2	3.481713	-0.1
2004.3	3.602232	-0.16667
2004.4	2.548063	-0.03333
2005.1	3.072837	-0.13333
2005.2	2.812687	-0.2
2005.3	4.461999	-0.06667
2005.4	1.193643	-0.03333
2006.1	4.820432	-0.23333
2006.2	2.442263	-0.1
2006.3	1.065549	0.066667
2006.4	2.090875	-0.23333
2007.1	0.601589	0.033333
2007.2	3.382239	0
	2.963692	

Knotek's Annual Data, Email of July 28, 2011

	dy	du
1949	-1.69481	2.6
1950	13.43641	-2.3
1951	5.165233	-1.2
1952	5.112117	-0.4
1953	0.425678	1.8
1954	2.694275	0.5
1955	6.523389	-0.8
1956	1.834944	0
1957	0.26241	1
1958	2.420938	1
1959	4.88075	-0.9
1960	0.552262	1.3
1961	6.283822	-0.6
1962	4.111255	-0.5
1963	5.321168	0
1964	5.12163	-0.5
1965	8.51134	-1
1966	4.310711	-0.2
1967	2.460902	0
1968	4.940026	-0.4
1969	2.012459	0.1
1970	-0.17258	2.6
1971	4.470982	-0.1
1972	6.894269	-0.8
1973	4.15843	-0.3
1974	-1.92989	2.3
1975	2.539113	1
1976	4.247578	-0.4
1977	5.032064	-1.4
1978	6.689095	-0.4
1979	1.310001	0
1980	-0.04995	1.2
1981	1.17837	1.3
1982	-1.39834	2.3
1983	7.720914	-2.5
1984	5.579107	-1
1985	4.171185	-0.3
1986	2.842924	-0.4
1987	4.481766	-0.9
1988	3.659866	-0.4
1989	2.661858	0.1
1990	0.654255	0.9
1991	1.090873	1
1992	4.145874	0.1
1993	2.505805	-0.9
1994	4.113965	-1
1995	2.017204	0.1
1996	4.420611	-0.2
1997	4.342077	-0.7
1998	4.510997	-0.3
1999	4.698444	-0.4
2000	2.239662	-0.1
2001	0.225533	1.8
2002	1.874874	0.3
2003	3.676776	-0.3
2004	3.40021	-0.3
2005	3.149803	-0.5
2006	3.127967	-0.4

The following tables indicate the governmental data sets from which are derived these charts and calculations.

This first table states the size of GDP as measured quarterly. These numbers form the basis for calculating GDP growth. Annual GDP growth is calculated as 100*((GDP in the fourth quarter of this year)/(GDP in the fourth quarter of last year)-1). Quarterly GDP figures are annualized according to the formula provided by the Bureau of Economic Analysis.[4]

Table 1.1.6. Real Gross Domestic Product, Chained Dollars

[Billions of chained (2000) dollars]; Seasonally adjusted at annual rates
Quarterly data from 1947 To 2007
Bureau of Economic Analysis
Data published September 27, 2007
File created 9/26/2007 9:47:04 AM

		Gross domestic product	Current Quarter Divided by Previous Quarter	Seasonally Adjusted Annualized Growth Rate ((Current Quarter divided by Previous Quarter)^4 minus 1)	Copy of Previous Column (Values Only)	Make Column F a Percent (Multiply by 100)
1947	1	1,570.5				
1947	2	1,568.7	0.999	-0.00458	-0.00458	-0.45767
1947	3	1,568.0	1.000	-0.00178	-0.00178	-0.17837
1947	4	1,590.9	1.015	0.05971	0.05971	5.97106
1948	1	1,616.1	1.016	0.06488	0.06488	6.48818
1948	2	1,644.6	1.018	0.07243	0.07243	7.24282
1948	3	1,654.1	1.006	0.02331	0.02331	2.33069
1948	4	1,658.0	1.002	0.00946	0.00946	0.94645
1949	1	1,633.2	0.985	-0.05850	-0.05850	-5.85020
1949	2	1,628.4	0.997	-0.01170	-0.01170	-1.17043
1949	3	1,646.7	1.011	0.04572	0.04572	4.57156
1949	4	1,629.9	0.990	-0.04019	-0.04019	-4.01886
1950	1	1,696.8	1.041	0.17457	0.17457	17.45697
1950	2	1,747.3	1.030	0.12447	0.12447	12.44685
1950	3	1,815.8	1.039	0.16628	0.16628	16.62782
1950	4	1,848.9	1.018	0.07493	0.07493	7.49336
1951	1	1,871.3	1.012	0.04935	0.04935	4.93491
1951	2	1,903.1	1.017	0.06973	0.06973	6.97265
1951	3	1,941.1	1.020	0.08229	0.08229	8.22939
1951	4	1,944.4	1.002	0.00682	0.00682	0.68176
1952	1	1,964.7	1.010	0.04242	0.04242	4.24195
1952	2	1,966.0	1.001	0.00265	0.00265	0.26493
1952	3	1,978.8	1.007	0.02630	0.02630	2.62982
1952	4	2,043.8	1.033	0.13801	0.13801	13.80097
1953	1	2,082.3	1.019	0.07751	0.07751	7.75058
1953	2	2,098.1	1.008	0.03070	0.03070	3.06982
1953	3	2,085.4	0.994	-0.02399	-0.02399	-2.39934
1953	4	2,052.5	0.984	-0.06163	-0.06163	-6.16277
1954	1	2,042.4	0.995	-0.01954	-0.01954	-1.95385
1954	2	2,044.3	1.001	0.00373	0.00373	0.37263
1954	3	2,066.9	1.011	0.04496	0.04496	4.49592
1954	4	2,107.8	1.020	0.08153	0.08153	8.15329
1955	1	2,168.5	1.029	0.12026	0.12026	12.02633
1955	2	2,204.0	1.016	0.06711	0.06711	6.71087
1955	3	2,233.4	1.013	0.05443	0.05443	5.44347
1955	4	2,245.3	1.005	0.02148	0.02148	2.14837
1956	1	2,234.8	0.995	-0.01857	-0.01857	-1.85749
1956	2	2,252.5	1.008	0.03206	0.03206	3.20591
1956	3	2,249.8	0.999	-0.00479	-0.00479	-0.47861
1956	4	2,286.5	1.016	0.06686	0.06686	6.68643
1957	1	2,300.3	1.006	0.02436	0.02436	2.43611
1957	2	2,294.6	0.998	-0.00987	-0.00987	-0.98750
1957	3	2,317.0	1.010	0.03962	0.03962	3.96237
1957	4	2,292.5	0.989	-0.04163	-0.04163	-4.16299
1958	1	2,230.2	0.973	-0.10435	-0.10435	-10.43510
1958	2	2,243.4	1.006	0.02389	0.02389	2.38860
1958	3	2,295.2	1.023	0.09561	0.09561	9.56082
1958	4	2,348.0	1.023	0.09524	0.09524	9.52424
1959	1	2,392.9	1.019	0.07871	0.07871	7.87128
1959	2	2,455.8	1.026	0.10936	0.10936	10.93633
1959	3	2,453.9	0.999	-0.00309	-0.00309	-0.30911
1959	4	2,462.6	1.004	0.01426	0.01426	1.42571
1960	1	2,517.4	1.022	0.09203	0.09203	9.20271
1960	2	2,504.8	0.995	-0.01987	-0.01987	-1.98708
1960	3	2,508.7	1.002	0.00624	0.00624	0.62426
1960	4	2,476.2	0.987	-0.05082	-0.05082	-5.08214
1961	1	2,491.2	1.006	0.02445	0.02445	2.44517
1961	2	2,538.0	1.019	0.07729	0.07729	7.72887
1961	3	2,579.1	1.016	0.06637	0.06637	6.63659
1961	4	2,631.8	1.020	0.08427	0.08427	8.42734
1962	1	2,679.1	1.018	0.07385	0.07385	7.38513
1962	2	2,708.4	1.011	0.04447	0.04447	4.44689
1962	3	2,733.3	1.009	0.03728	0.03728	3.72847
1962	4	2,740.0	1.002	0.00984	0.00984	0.98411
1963	1	2,775.9	1.013	0.05345	0.05345	5.34478
1963	2	2,810.6	1.013	0.05095	0.05095	5.09472
1963	3	2,863.5	1.019	0.07744	0.07744	7.74387
1963	4	2,885.8	1.008	0.03152	0.03152	3.15165
1964	1	2,950.5	1.022	0.09274	0.09274	9.27418
1964	2	2,984.8	1.012	0.04732	0.04732	4.73178
1964	3	3,025.5	1.014	0.05567	0.05567	5.56688
1964	4	3,033.6	1.003	0.01075	0.01075	1.07521
1965	1	3,108.2	1.025	0.10205	0.10205	10.20532
1965	2	3,150.2	1.014	0.05516	0.05516	5.51560
1965	3	3,214.1	1.020	0.08364	0.08364	8.36400
1965	4	3,291.8	1.024	0.10026	0.10026	10.02623
1966	1	3,372.3	1.024	0.10147	0.10147	10.14659
1966	2	3,384.0	1.003	0.01395	0.01395	1.39502
1966	3	3,406.3	1.007	0.02662	0.02662	2.66210
1966	4	3,433.7	1.008	0.03257	0.03257	3.25660
1967	1	3,464.1	1.009	0.03589	0.03589	3.58868
1967	2	3,464.3	1.000	0.00023	0.00023	0.02310
1967	3	3,491.8	1.008	0.03213	0.03213	3.21325
1967	4	3,518.2	1.008	0.03059	0.03059	3.05870
1968	1	3,590.7	1.021	0.08501	0.08501	8.50116
1968	2	3,651.6	1.017	0.06959	0.06959	6.95875
1968	3	3,676.5	1.007	0.02756	0.02756	2.75560
1968	4	3,692.0	1.004	0.01697	0.01697	1.69708
1969	1	3,750.2	1.016	0.06456	0.06456	6.45620
1969	2	3,760.9	1.003	0.01146	0.01146	1.14617
1969	3	3,784.2	1.006	0.02501	0.02501	2.50125
1969	4	3,766.3	0.995	-0.01879	-0.01879	-1.87870
1970	1	3,760.0	0.998	-0.00667	-0.00667	-0.66741
1970	2	3,767.1	1.002	0.00757	0.00757	0.75746
1970	3	3,800.5	1.009	0.03594	0.03594	3.59394
1970	4	3,759.8	0.989	-0.04215	-0.04215	-4.21533
1971	1	3,864.1	1.028	0.11567	0.11567	11.56667
1971	2	3,885.9	1.006	0.02276	0.02276	2.27584
1971	3	3,916.7	1.008	0.03208	0.03208	3.20833
1971	4	3,927.9	1.003	0.01149	0.01149	1.14874
1972	1	3,997.7	1.018	0.07300	0.07300	7.29985
1972	2	4,092.1	1.024	0.09785	0.09785	9.78529
1972	3	4,131.1	1.010	0.03867	0.03867	3.86707
1972	4	4,198.7	1.016	0.06708	0.06708	6.70789
1973	1	4,305.3	1.025	0.10549	0.10549	10.54887
1973	2	4,355.1	1.012	0.04708	0.04708	4.70776
1973	3	4,331.9	0.995	-0.02114	-0.02114	-2.11387
1973	4	4,373.3	1.010	0.03878	0.03878	3.87795
1974	1	4,335.4	0.991	-0.03422	-0.03422	-3.42169
1974	2	4,347.9	1.003	0.01158	0.01158	1.15829
1974	3	4,305.8	0.990	-0.03817	-0.03817	-3.81724
1974	4	4,288.9	0.996	-0.01561	-0.01561	-1.56076
1975	1	4,237.6	0.988	-0.04699	-0.04699	-4.69929
1975	2	4,268.6	1.007	0.02958	0.02958	2.95845
1975	3	4,340.9	1.017	0.06949	0.06949	6.94914
1975	4	4,397.8	1.013	0.05347	0.05347	5.34715
1976	1	4,496.8	1.023	0.09313	0.09313	9.31315
1976	2	4,530.3	1.007	0.03013	0.03013	3.01336
1976	3	4,552.0	1.005	0.01930	0.01930	1.92980
1976	4	4,584.6	1.007	0.02896	0.02896	2.89560
1977	1	4,640.0	1.012	0.04922	0.04922	4.92189
1977	2	4,731.1	1.020	0.08088	0.08088	8.08778
1977	3	4,815.8	1.018	0.07356	0.07356	7.35574
1977	4	4,815.3	1.000	-0.00042	-0.00042	-0.04152
1978	1	4,830.8	1.003	0.01294	0.01294	1.29379
1978	2	5,021.2	1.039	0.16722	0.16722	16.72230
1978	3	5,070.7	1.010	0.04002	0.04002	4.00198
1978	4	5,137.4	1.013	0.05366	0.05366	5.36633
1979	1	5,147.4	1.002	0.00781	0.00781	0.78088
1979	2	5,152.3	1.001	0.00381	0.00381	0.38132
1979	3	5,189.4	1.007	0.02912	0.02912	2.91153
1979	4	5,204.7	1.003	0.01185	0.01185	1.18455
1980	1	5,221.3	1.003	0.01282	0.01282	1.28189
1980	2	5,115.9	0.980	-0.07833	-0.07833	-7.83339
1980	3	5,107.4	0.998	-0.00663	-0.00663	-0.66294
1980	4	5,202.1	1.019	0.07626	0.07626	7.62553
1981	1	5,307.5	1.020	0.08354	0.08354	8.35407
1981	2	5,266.1	0.992	-0.03084	-0.03084	-3.08380
1981	3	5,329.8	1.012	0.04927	0.04927	4.92700
1981	4	5,263.4	0.988	-0.04891	-0.04891	-4.89095
1982	1	5,177.1	0.984	-0.06399	-0.06399	-6.39895
1982	2	5,204.9	1.005	0.02165	0.02165	2.16528
1982	3	5,185.2	0.996	-0.01505	-0.01505	-1.50538
1982	4	5,189.8	1.001	0.00355	0.00355	0.35533
1983	1	5,253.8	1.012	0.05025	0.05025	5.02475
1983	2	5,372.3	1.023	0.09332	0.09332	9.33190
1983	3	5,478.4	1.020	0.08137	0.08137	8.13690
1983	4	5,590.5	1.020	0.08440	0.08440	8.43954
1984	1	5,699.8	1.020	0.08053	0.08053	8.05276
1984	2	5,797.9	1.017	0.07064	0.07064	7.06423
1984	3	5,854.3	1.010	0.03948	0.03948	3.94821
1984	4	5,902.4	1.008	0.03327	0.03327	3.32720
1985	1	5,956.9	1.009	0.03745	0.03745	3.74488
1985	2	6,007.8	1.009	0.03462	0.03462	3.46194
1985	3	6,101.7	1.016	0.06400	0.06400	6.39998
1985	4	6,148.6	1.008	0.03110	0.03110	3.11018
1986	1	6,207.4	1.010	0.03880	0.03880	3.88048
1986	2	6,232.0	1.004	0.01595	0.01595	1.59465
1986	3	6,291.7	1.010	0.03887	0.03887	3.88725
1986	4	6,323.4	1.005	0.02031	0.02031	2.03064
1987	1	6,365.0	1.007	0.02658	0.02658	2.65758
1987	2	6,435.0	1.011	0.04472	0.04472	4.47216
1987	3	6,493.4	1.009	0.03680	0.03680	3.67986
1987	4	6,606.8	1.017	0.07171	0.07171	7.17069
1988	1	6,639.1	1.005	0.01970	0.01970	1.96995
1988	2	6,723.5	1.013	0.05183	0.05183	5.18282
1988	3	6,759.4	1.005	0.02153	0.02153	2.15296
1988	4	6,848.6	1.013	0.05384	0.05384	5.38398
1989	1	6,918.1	1.010	0.04121	0.04121	4.12143
1989	2	6,963.5	1.007	0.02651	0.02651	2.65095
1989	3	7,013.1	1.007	0.02880	0.02880	2.87973
1989	4	7,030.9	1.003	0.01019	0.01019	1.01911
1990	1	7,112.1	1.012	0.04700	0.04700	4.70025
1990	2	7,130.3	1.003	0.01028	0.01028	1.02754
1990	3	7,130.8	1.000	0.00028	0.00028	0.02805
1990	4	7,076.9	0.992	-0.02989	-0.02989	-2.98940
1991	1	7,040.8	0.995	-0.02025	-0.02025	-2.02488
1991	2	7,086.5	1.006	0.02622	0.02622	2.62168
1991	3	7,120.7	1.005	0.01944	0.01944	1.94445
1991	4	7,154.1	1.005	0.01889	0.01889	1.88946
1992	1	7,228.2	1.010	0.04208	0.04208	4.20789
1992	2	7,297.9	1.010	0.03913	0.03913	3.91326
1992	3	7,369.5	1.010	0.03983	0.03983	3.98255
1992	4	7,450.7	1.011	0.04481	0.04481	4.48073
1994	1	7,715.1	1.010	0.04132	0.04132	4.13197
1994	2	7,815.7	1.013	0.05319	0.05319	5.31865
1994	3	7,859.5	1.006	0.02261	0.02261	2.26056
1994	4	7,951.6	1.012	0.04770	0.04770	4.77036
1995	1	7,973.7	1.003	0.01116	0.01116	1.11637
1995	2	7,988.0	1.002	0.00719	0.00719	0.71929
1995	3	8,053.1	1.008	0.03300	0.03300	3.29996
1995	4	8,112.0	1.007	0.02958	0.02958	2.95783
1996	1	8,169.2	1.007	0.02850	0.02850	2.85049
1996	2	8,303.1	1.016	0.06719	0.06719	6.71930
1996	3	8,372.7	1.008	0.03395	0.03395	3.39536
1996	4	8,470.6	1.012	0.04760	0.04760	4.75978
1997	1	8,536.1	1.008	0.03129	0.03129	3.12911
1997	2	8,665.8	1.015	0.06218	0.06218	6.21765
1997	3	8,773.7	1.012	0.05074	0.05074	5.07429
1997	4	8,838.4	1.007	0.02983	0.02983	2.98251
1998	1	8,936.2	1.011	0.04500	0.04500	4.50015
1998	2	8,995.3	1.007	0.02672	0.02672	2.67178
1998	3	9,098.9	1.012	0.04687	0.04687	4.68705
1998	4	9,237.1	1.015	0.06215	0.06215	6.21528
1999	1	9,315.5	1.008	0.03438	0.03438	3.43847
1999	2	9,392.6	1.008	0.03352	0.03352	3.35194
1999	3	9,502.2	1.012	0.04750	0.04750	4.74984
1999	4	9,671.1	1.018	0.07302	0.07302	7.30176
2000	1	9,695.6	1.003	0.01017	0.01017	1.01719
2000	2	9,847.9	1.016	0.06433	0.06433	6.43287
2000	3	9,836.6	0.999	-0.00458	-0.00458	-0.45819
2000	4	9,887.7	1.005	0.02094	0.02094	2.09420
2001	1	9,875.6	0.999	-0.00489	-0.00489	-0.48860
2001	2	9,905.9	1.003	0.01233	0.01233	1.23293
2001	3	9,871.1	0.996	-0.01398	-0.01398	-1.39784
2001	4	9,910.0	1.004	0.01586	0.01586	1.58566
2002	1	9,977.3	1.007	0.02744	0.02744	2.74425
2002	2	10,031.6	1.005	0.02195	0.02195	2.19478
2002	3	10,090.7	1.006	0.02377	0.02377	2.37746
2002	4	10,095.8	1.001	0.00202	0.00202	0.20232
2003	1	10,126.0	1.003	0.01202	0.01202	1.20192
2003	2	10,212.7	1.009	0.03469	0.03469	3.46908
2003	3	10,398.7	1.018	0.07486	0.07486	7.48649
2003	4	10,467.0	1.007	0.02653	0.02653	2.65325
2004	1	10,543.6	1.007	0.02960	0.02960	2.95959
2004	2	10,634.2	1.009	0.03482	0.03482	3.48171
2004	3	10,728.7	1.009	0.03602	0.03602	3.60223
2004	4	10,796.4	1.006	0.02548	0.02548	2.54806
2005	1	10,878.4	1.008	0.03073	0.03073	3.07284
2005	2	10,954.1	1.007	0.02813	0.02813	2.81269
2005	3	11,074.3	1.011	0.04462	0.04462	4.46200
2005	4	11,107.2	1.003	0.01194	0.01194	1.19364
2006	1	11,238.7	1.012	0.04820	0.04820	4.82043
2006	2	11,306.7	1.006	0.02442	0.02442	2.44226
2006	3	11,336.7	1.003	0.01066	0.01066	1.06555
2006	4	11,395.5	1.005	0.02091	0.02091	2.09087
2007	1	11,412.6	1.002	0.00602	0.00602	0.60159
2007	2	11,520.1	1.009	0.03821	0.03821	3.82134

It is important to mention at the outset that the character of GDP is quite different from the character of employment. Unlike employment, the measure of GDP begins with the fact that, like any object which grows, it has size. Sharing a commonality with the size of a dog, a flower or a tree, the measurement of GDP above is intended to give an estimate of the size of the economy as an objective entity.

This is important to mention because the *growth* of GDP is considered from two standpoints. The first is growth over the course of a year (Annual). The second, relating to quarterly GDP, is figured from a mathematic algorithm. In this algorithm (1) the current quarter is divided by the previous quarter, (2) this is then taken to the fourth power, (3) from this figure we subtract one and (4) make this number a percent by multiplying by 100.

The purpose of these procedures is to find the rate of growth of an object. Using estimates of the growth rate over quarters, which are four times as numerous as annual estimates, we might expect that these repeated quarterly annual-izations render a much more precise value

4 See email of October 10, 2011.

than is possible for annual data. This is quite unlike the nature of a measurement of quarterly and annual employment as we shall see.

The next table below states the employment rate in months. For annual data, the change in the unemployment rate is the current December minus the previous December. For quarterly data, the change in the unemployment rate is the difference between subsequent quarterly averages.[5]

Monthly Unemployment, Bureau of Labor Statistics
Labor Force Statistics from the Current Population Survey

Series Id: LNS14000000
Seasonally Adjusted
Series title: (Seas) Unemployment Rate
Labor force status: Unemployment rate
Type of data: Percent or rate
Age: 16 years and over

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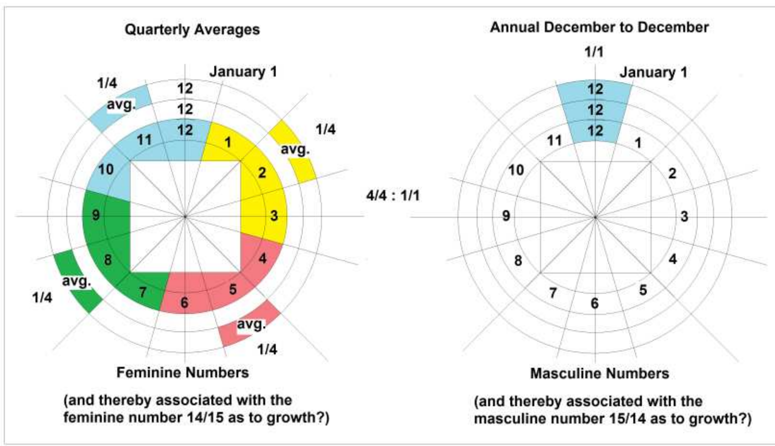
Year	Jan	Feb	Mar	1st Quarter Average (example: "1948.1")	Apr	May	Jun	2nd Quarter Average (example: "1948.2")	Jul	Aug	Sep	3rd Quarter Average (example: "1948.3")	Oct	Nov	Dec	4th Quarter Average (example: "1948.4")	Annual
1948	3.4	3.8	4	3.733333333	3.9	3.5	3.6	3.666666667	3.6	3.9	3.8	3.766666667	3.7	3.8	4	3.833333333	
1949	4.3	4.7	5	4.666666667	5.3	6.1	6.2	5.866666667	6.7	6.8	6.6	6.7	7.9	6.4	6.6	6.966666667	
1950	6.5	6.4	6.3	6.4	5.8	5.5	5.4	5.566666667	5	4.5	4.4	4.633333333	4.2	4.2	4.3	4.233333333	
1951	3.7	3.4	3.4	3.5	3.1	3	3.2	3.1	3.1	3.1	3.3	3.166666667	3.5	3.5	3.1	3.366666667	
1952	3.2	3.1	2.9	3.066666667	2.9	3	3	2.966666667	3.2	3.4	3.1	3.233333333	3	2.8	2.7	2.833333333	
1953	2.9	2.6	2.6	2.7	2.7	2.5	2.5	2.566666667	2.6	2.7	2.9	2.733333333	3.1	3.5	4.5	3.7	
1954	4.9	5.2	5.7	5.266666667	5.9	5.9	5.6	5.8	5.8	6	6.1	5.966666667	5.7	5.3	5	5.333333333	
1955	4.9	4.7	4.6	4.733333333	4.7	4.3	4.2	4.4	4	4.2	4.1	4.1	4.3	4.2	4.2	4.233333333	
1956	4	3.9	4.2	4.033333333	4	4.3	4.3	4.2	4.4	4.1	3.9	4.133333333	3.9	4.3	4.2	4.133333333	
1957	4.2	3.9	3.7	3.933333333	3.9	4.1	4.3	4.1	4.2	4.1	4.4	4.233333333	4.5	5.1	5.2	4.933333333	
1958	5.8	6.4	6.7	6.3	7.4	7.4	7.3	7.366666667	7.5	7.4	7.1	7.333333333	6.7	6.2	6.2	6.366666667	
1959	6	5.9	5.6	5.833333333	5.2	5.1	5	5.1	5.1	5.2	5.5	5.266666667	5.7	5.8	5.3	5.6	
1960	5.2	4.8	5.4	5.133333333	5.2	5.1	5.4	5.233333333	5.5	5.6	5.5	5.533333333	6.1	6.1	6.6	6.266666667	
1961	6.6	6.9	6.9	6.8	7	7.1	6.9	7	7	6.6	6.7	6.766666667	6.5	6.1	6	6.2	
1962	5.8	5.5	5.6	5.633333333	5.6	5.5	5.5	5.533333333	5.4	5.7	5.6	5.566666667	5.4	5.7	5.5	5.533333333	
1963	5.7	5.9	5.7	5.766666667	5.7	5.9	5.6	5.733333333	5.6	5.4	5.5	5.5	5.5	5.7	5.5	5.566666667	
1964	5.6	5.4	5.4	5.466666667	5.3	5.1	5.2	5.2	4.9	5	5.1	5	5.1	4.8	5	4.966666667	
1965	4.9	5.1	4.7	4.9	4.8	4.6	4.6	4.666666667	4.4	4.4	4.3	4.366666667	4.2	4.1	4	4.1	
1966	4	3.8	3.8	3.866666667	3.8	3.9	3.8	3.833333333	3.8	3.8	3.7	3.766666667	3.7	3.6	3.8	3.7	
1967	3.9	3.8	3.8	3.833333333	3.8	3.8	3.9	3.833333333	3.8	3.8	3.8	3.8	4	3.9	3.8	3.9	
1968	3.7	3.8	3.7	3.733333333	3.5	3.5	3.7	3.566666667	3.7	3.5	3.4	3.533333333	3.4	3.4	3.4	3.4	
1969	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.433333333	3.5	3.5	3.7	3.566666667	3.7	3.5	3.5	3.566666667	
1970	3.9	4.2	4.4	4.166666667	4.6	4.8	4.9	4.766666667	5	5.1	5.4	5.166666667	5.5	5.9	6.1	5.833333333	
1971	5.9	5.9	6	5.933333333	5.9	5.9	5.9	5.9	6	6.1	6	6.033333333	5.8	6	6	5.933333333	
1972	5.8	5.7	5.8	5.766666667	5.7	5.7	5.7	5.7	5.6	5.6	5.5	5.566666667	5.6	5.3	5.2	5.366666667	
1973	4.9	5	4.9	4.933333333	5	4.9	4.9	4.933333333	4.8	4.8	4.8	4.8	4.6	4.8	4.9	4.766666667	
1974	5.1	5.2	5.1	5.133333333	5.1	5.1	5.4	5.2	5.5	5.5	5.9	5.633333333	6	6.6	7.2	6.6	
1975	8.1	8.1	8.6	8.266666667	8.8	9	8.8	8.866666667	8.6	8.4	8.4	8.466666667	8.4	8.3	8.2	8.3	
1976	7.9	7.7	7.6	7.733333333	7.7	7.4	7.6	7.566666667	7.8	7.8	7.6	7.733333333	7.7	7.8	7.8	7.766666667	
1977	7.5	7.6	7.4	7.5	7.2	7	7.2	7.133333333	6.9	7	6.8	6.9	6.8	6.8	6.4	6.666666667	
1978	6.4	6.3	6.3	6.333333333	6.1	6	5.9	6	6.2	5.9	6	6.033333333	5.8	5.9	6	5.9	
1979	5.9	5.9	5.8	5.866666667	5.8	5.6	5.7	5.7	5.7	6	5.9	5.866666667	6	5.9	6	5.966666667	
1980	6.3	6.3	6.3	6.3	6.9	7.5	7.6	7.333333333	7.8	7.7	7.5	7.666666667	7.5	7.5	7.2	7.4	
1981	7.5	7.4	7.4	7.433333333	7.2	7.5	7.5	7.4	7.2	7.4	7.6	7.4	7.9	8.3	8.5	8.233333333	
1982	8.6	8.9	9	8.833333333	9.3	9.4	9.6	9.433333333	9.8	9.8	10.1	9.9	10.4	10.8	10.8	10.66666667	
1983	10.4	10.4	10.3	10.36666667	10.2	10.1	10.1	10.13333333	9.4	9.5	9.2	9.366666667	8.8	8.5	8.3	8.533333333	
1984	8	7.8	7.8	7.866666667	7.7	7.4	7.2	7.433333333	7.5	7.5	7.3	7.433333333	7.4	7.2	7.3	7.3	
1985	7.3	7.2	7.2	7.233333333	7.3	7.2	7.4	7.3	7.4	7.1	7.1	7.2	7.1	7	7	7.033333333	
1986	6.7	7.2	7.2	7.033333333	7.1	7.2	7.2	7.166666667	7	6.9	7	6.966666667	7	6.9	6.6	6.833333333	
1987	6.6	6.6	6.6	6.6	6.3	6.3	6.2	6.266666667	6.1	6	5.9	6	6	5.8	5.7	5.833333333	
1988	5.7	5.7	5.7	5.7	5.4	5.6	5.4	5.466666667	5.4	5.6	5.4	5.466666667	5.4	5.3	5.3	5.333333333	
1989	5.4	5.2	5	5.2	5.2	5.2	5.3	5.233333333	5.2	5.2	5.3	5.233333333	5.3	5.4	5.4	5.366666667	
1990	5.4	5.3	5.2	5.3	5.4	5.4	5.2	5.333333333	5.5	5.7	5.9	5.7	5.9	6.2	6.3	6.133333333	
1991	6.4	6.6	6.8	6.6	6.7	6.9	6.9	6.833333333	6.8	6.9	6.9	6.866666667	7	7	7.3	7.1	
1992	7.3	7.4	7.4	7.366666667	7.4	7.6	7.8	7.6	7.7	7.6	7.6	7.633333333	7.3	7.4	7.4	7.366666667	
1993	7.3	7.1	7	7.133333333	7.1	7.1	7	7.066666667	6.9	6.8	6.7	6.8	6.8	6.6	6.5	6.633333333	
1994	6.6	6.6	6.5	6.566666667	6.4	6.1	6.1	6.2	6.1	6	5.9	6	5.8	5.6	5.5	5.633333333	
1995	5.6	5.4	5.4	5.466666667	5.8	5.6	5.6	5.666666667	5.7	5.7	5.6	5.666666667	5.5	5.6	5.6	5.566666667	
1996	5.6	5.5	5.5	5.533333333	5.6	5.6	5.3	5.5	5.5	5.1	5.2	5.266666667	5.2	5.4	5.4	5.333333333	
1997	5.3	5.2	5.2	5.233333333	5.1	4.9	5	5	4.9	4.8	4.9	4.866666667	4.7	4.6	4.7	4.666666667	
1998	4.6	4.6	4.7	4.633333333	4.3	4.4	4.5	4.4	4.5	4.5	4.6	4.533333333	4.5	4.4	4.4	4.433333333	
1999	4.3	4.4	4.2	4.3	4.3	4.2	4.3	4.266666667	4.3	4.2	4.2	4.233333333	4.1	4.1	4	4.066666667	
2000	4	4.1	4	4.033333333	3.8	4	4	3.933333333	4	4.1	3.9	4	3.9	3.9	3.9	3.9	
2001	4.2	4.2	4.3	4.233333333	4.4	4.3	4.5	4.4	4.6	4.9	5	4.833333333	5.3	5.5	5.7	5.5	
2002	5.7	5.7	5.7	5.7	5.9	5.8	5.8	5.833333333	5.8	5.7	5.7	5.733333333	5.7	5.9	6	5.866666667	
2003	5.8	5.9	5.9	5.866666667	6	6.1	6.3	6.133333333	6.2	6.1	6.1	6.133333333	6	5.8	5.7	5.833333333	
2004	5.7	5.6	5.8	5.7	5.6	5.6	5.6	5.6	5.5	5.4	5.4	5.433333333	5.5	5.4	5.4	5.433333333	
2005	5.3	5.4	5.2	5.3	5.2	5.1	5	5.1	5	4.9	5	4.966666667	5	5	4.9	4.966666667	
2006	4.7	4.8	4.7	4.733333333	4.7	4.6	4.6	4.633333333	4.7	4.7	4.5	4.633333333	4.4	4.5	4.4	4.433333333	
2007	4.6	4.5	4.4	4.5	4.5	4.4	4.6	4.5	4.7	4.6	4.7	4.666666667	4.7	4.7	5	4.8	
2008	5	4.8	5.1	4.966666667	4.9	5.4	5.6	5.3	5.8	6.1	6.2	6.033333333	6.6	6.8	7.3	6.9	
2009	7.8	8.2	8.6	8.2	8.9	9.4	9.5	9.266666667	9.5	9.7	9.8	9.666666667	10.1	9.9	9.9	9.966666667	
2010	9.7	9.7	9.7	9.7	9.8	9.6	9.5	9.633333333	9.5	9.6	9.6	9.566666667	9.7	9.8	9.4	9.633333333	
2011	9	8.9	8.8	8.9	9	9.1	9.2	9.1	9.1	9.1	9.1	9.1					

5 See email of October 10, 2011.

The above chart is of specific interest as it relates to the calculation of quantities of monthly unemployment in both their "feminine" and "masculine" characteristics, or put another way, their "circumferential" and "radial" characteristics.

To make the distinction plain, let us imagine that the march of months within a year was made congruent to the 12 hours on the face of the clock. The manner in which the data for unemployment is collected and analyzed against itself partakes of the circular nature of a unit circle. In this way the average of each quarter is taken and compared with the average of each other quarter. This is portrayed in the left hand side of the following chart.

Contrast this with a single month, chosen from the twelve, and it alone being contrasted with the same month of the following year, and then the following year, and so on.



On the left we have a circumferential relationship between quarterly data which itself relies upon a circular sense of time, a legitimate apportion-izing of something which itself is taken as a "1." On the right we have a distinctly different and radial view of time, one which does not accept any obvious limitation to its ongoing list of endless Decembers.[6]

Note that the estimation of a "quarterly" rate for unemployment takes as its beginning source of numeric encouragement the idea that it is $1/4^{\text{th}}$ of something else, specifically a sub-part of a 12-month, four-quarter year. If we were to have a full year specified in quarters then numerically we would be interested in a year stated as 4/4 which, according to number theory, would equal a single year.

Conversely the statement of an "annual" rate of unemployment seeks not an association between the data and the year itself, but rather to an *on-going set of years in sequence*. Consequently the rate of one December is compared to the rate of the next December and measured. In contrast to the quarterly data – which by definition is part of some other wholeness – we might state annual data as a repeated sense of "1," each point repeating itself in endless time, a 1/1.

Here we enter into the intrigues and quiet thoughts of the numbers themselves. Placing both feminine and masculine numbers together we see above a hinted "radius : 2π" relationship

[66] It must be noted, however, that the GNP Spiral assumes a further circular aspect of time applying even to annual data. Consequently the 14/15 association of feminine numbers in this regard, and the 15/14 association with masculine numbers remains a connected aspect of this insight. In short, if the annual data itself falls into a larger circumferential relationship, what relationship might this have to the quarterly data which are, at best, a sub-part of the GNP Spiral and its $1:\varphi$ ratio over a span of 56 years?

between annual and quarterly approaches using a single data set describing unemployment and a second single data set describing GDP growth.

Do the feminine (0<F<1) numbers maintain a secret relationship with the quarterly employment figures, their circumferential sense of time and the fraction 14/15 as these relate to the GNP Spiral / Kondratiev Wave, perhaps "filling up" the space between moments of time?

Do the masculine (1<M) numbers share an equally hidden relationship with annual employment figures, their radial sense of time and the fraction 15/14 as these relate to the GNP Spiral / Kondratiev Wave, perhaps setting up "boundaries" separating moments of time?

Under what circumstances might these secrets be revealed, secrets which although hidden, tentative and circumspect, might actually bear an inverse relationship of some sort to one another?

The following states the annual measures of GNP as compared with Dr. Knotek.

Change in Annual Unemployment vs. Change in Annual GDP

Quarterly GDP, Bureau of Economic Analysis

Table 1.1.6. Real Gross Domestic Product, Chained Dollars

[Billions of chained (2000) dollars]; Seasonally adjusted at annual rates

Quarterly data from 1947 To 2007

Bureau of Economic Analysis

Data published September 27, 2007

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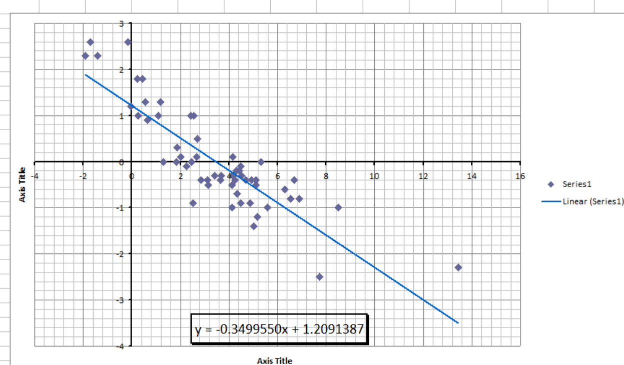
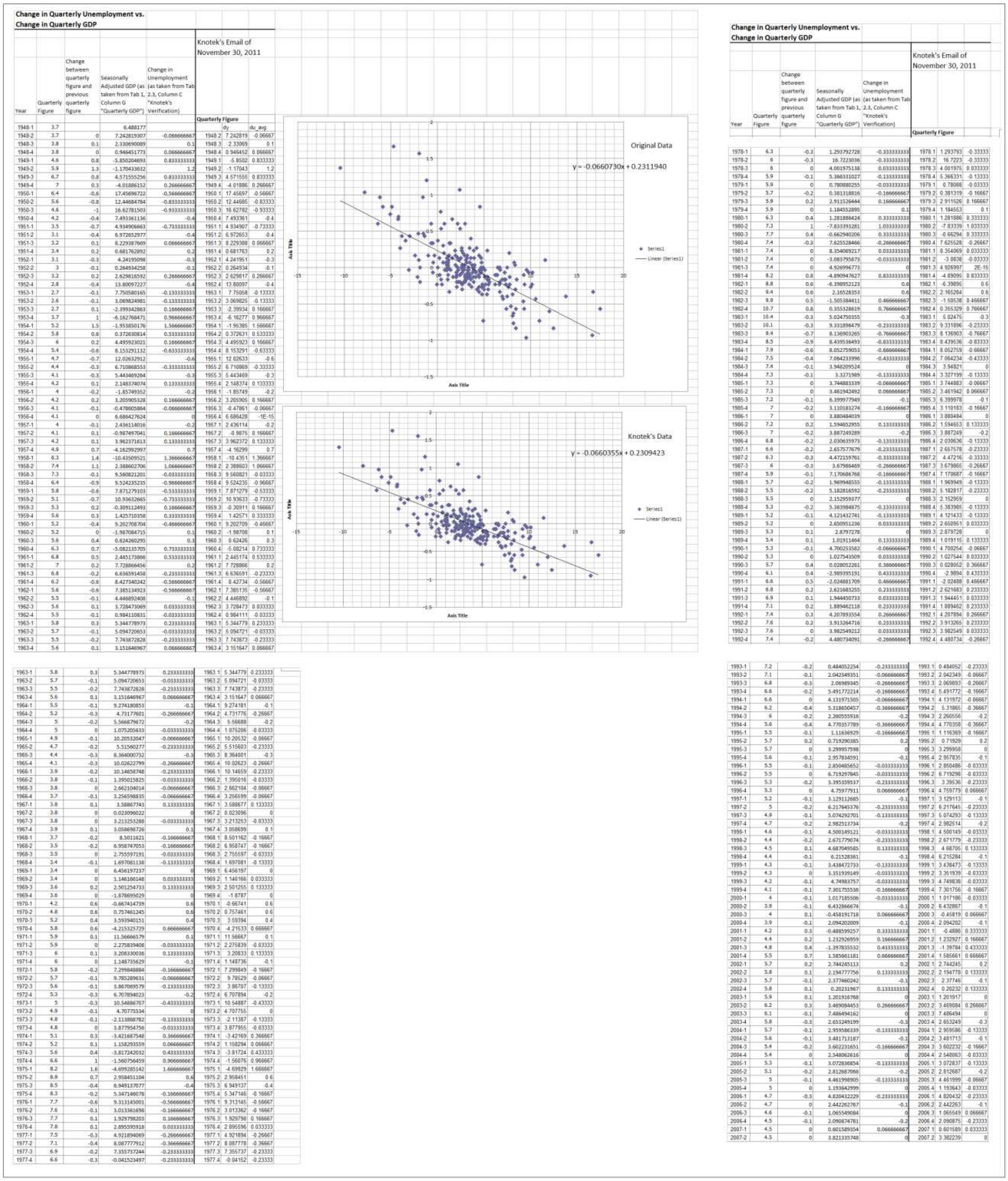
					Albers' GDP Calculations from Table 1.1.6, September 27, 2007			Knotek's Annual Data as provided through correspondence		
		Gross domestic product			Quarter 4 divided by Quarter 4	Minus 1	Multiply 100			
1947	**4**	**1,590.9**								
1948	**4**	**1,658.0**	1948	4	1.042177	n=m-1	n=mx100		dy	du
1949	**4**	**1,629.9**	1949	4	0.983052	-0.01695	-1.694813	1949	-1.69481	2.6
1950	**4**	**1,848.9**	1950	4	1.134364	0.134364	13.436407	1950	13.43641	-2.3
1951	**4**	**1,944.4**	1951	4	1.051652	0.051652	5.1652334	1951	5.165233	-1.2
1952	**4**	**2,043.8**	1952	4	1.051121	0.051121	5.1121168	1952	5.112117	-0.4
1953	**4**	**2,052.5**	1953	4	1.004257	0.004257	0.4256777	1953	0.425678	1.8
1954	**4**	**2,107.8**	1954	4	1.026943	0.026943	2.6942753	1954	2.694275	0.5
1955	**4**	**2,245.3**	1955	4	1.065234	0.065234	6.5233893	1955	6.523389	-0.8
1956	**4**	**2,286.5**	1956	4	1.018349	0.018349	1.8349441	1956	1.834944	0
1957	**4**	**2,292.5**	1957	4	1.002624	0.002624	0.2624098	1957	0.26241	1
1958	**4**	**2,348.0**	1958	4	1.024209	0.024209	2.4209378	1958	2.420938	1
1959	**4**	**2,462.6**	1959	4	1.048807	0.048807	4.8807496	1959	4.88075	-0.9
1960	**4**	**2,476.2**	1960	4	1.005523	0.005523	0.5522618	1960	0.552262	1.3
1961	**4**	**2,631.8**	1961	4	1.062838	0.062838	6.283822	1961	6.283822	-0.6
1962	**4**	**2,740.0**	1962	4	1.041113	0.041113	4.1112547	1962	4.111255	-0.5
1963	**4**	**2,885.8**	1963	4	1.053212	0.053212	5.3211679	1963	5.321168	0
1964	**4**	**3,033.6**	1964	4	1.051216	0.051216	5.1216301	1964	5.12163	-0.5
1965	**4**	**3,291.8**	1965	4	1.085113	0.085113	8.5113397	1965	8.51134	-1
1966	**4**	**3,433.7**	1966	4	1.043107	0.043107	4.3107115	1966	4.310711	-0.2
1967	**4**	**3,518.2**	1967	4	1.024609	0.024609	2.4609022	1967	2.460902	0
1968	**4**	**3,692.0**	1968	4	1.0494	0.0494	4.9400261	1968	4.940026	-0.4
1969	**4**	**3,766.3**	1969	4	1.020125	0.020125	2.0124594	1969	2.012459	0.1
1970	**4**	**3,759.8**	1970	4	0.998274	-0.00173	-0.1725832	1970	-0.17258	2.6
1971	**4**	**3,927.9**	1971	4	1.04471	0.04471	4.4709825	1971	4.470982	-0.1
1972	**4**	**4,198.7**	1972	4	1.068943	0.068943	6.8942692	1972	6.894269	-0.8
1973	**4**	**4,373.3**	1973	4	1.041584	0.041584	4.15843	1973	4.15843	-0.3
1974	**4**	**4,288.9**	1974	4	0.980701	-0.0193	-1.9298928	1974	-1.92989	2.3
1975	**4**	**4,397.8**	1975	4	1.025391	0.025391	2.5391126	1975	2.539113	1
1976	**4**	**4,584.6**	1976	4	1.042476	0.042476	4.2475783	1976	4.247578	-0.4
1977	**4**	**4,815.3**	1977	4	1.050321	0.050321	5.0320639	1977	5.032064	-1.4
1978	**4**	**5,137.4**	1978	4	1.066891	0.066891	6.6890952	1978	6.689095	-0.4
1979	**4**	**5,204.7**	1979	4	1.0131	0.0131	1.3100012	1979	1.310001	0
1980	**4**	**5,202.1**	1980	4	0.9995	-0.0005	-0.0499548	1980	-0.04995	1.2
1981	**4**	**5,263.4**	1981	4	1.011784	0.011784	1.1783703	1981	1.17837	1.3
1982	**4**	**5,189.8**	1982	4	0.986017	-0.01398	-1.3983357	1982	-1.39834	2.3
1983	**4**	**5,590.5**	1983	4	1.077209	0.077209	7.7209141	1983	7.720914	-2.5
1984	**4**	**5,902.4**	1984	4	1.055791	0.055791	5.5791074	1984	5.579107	-1
1985	**4**	**6,148.6**	1985	4	1.041712	0.041712	4.1711846	1985	4.171185	-0.3
1986	**4**	**6,323.4**	1986	4	1.028429	0.028429	2.8429236	1986	2.842924	-0.4
1987	**4**	**6,606.8**	1987	4	1.044818	0.044818	4.4817661	1987	4.481766	-0.9
1988	**4**	**6,848.6**	1988	4	1.036599	0.036599	3.6598656	1988	3.659866	-0.4
1989	**4**	**7,030.9**	1989	4	1.026619	0.026619	2.6618579	1989	2.661858	0.1
1990	**4**	**7,076.9**	1990	4	1.006543	0.006543	0.6542548	1990	0.654255	0.9
1991	**4**	**7,154.1**	1991	4	1.010909	0.010909	1.0908731	1991	1.090873	1
1992	**4**	**7,450.7**	1992	4	1.041459	0.041459	4.1458744	1992	4.145874	0.1
1993	**4**	**7,637.4**	1993	4	1.025058	0.025058	2.5058048	1993	2.505805	-0.9
1994	**4**	**7,951.6**	1994	4	1.04114	0.04114	4.1139655	1994	4.113965	-1
1995	**4**	**8,112.0**	1995	4	1.020172	0.020172	2.0172041	1995	2.017204	0.1
1996	**4**	**8,470.6**	1996	4	1.044206	0.044206	4.4206114	1996	4.420611	-0.2
1997	**4**	**8,838.4**	1997	4	1.043421	0.043421	4.3420773	1997	4.342077	-0.7
1998	**4**	**9,237.1**	1998	4	1.04511	0.04511	4.5109975	1998	4.510997	-0.3
1999	**4**	**9,671.1**	1999	4	1.046984	0.046984	4.6984443	1999	4.698444	-0.4
2000	**4**	**9,887.7**	2000	4	1.022397	0.022397	2.2396625	2000	2.239662	-0.1
2001	**4**	**9,910.0**	2001	4	1.002255	0.002255	0.2255327	2001	0.225533	1.8
2002	**4**	**10,095.8**	2002	4	1.018749	0.018749	1.8748739	2002	1.874874	0.3
2003	**4**	**10,467.0**	2003	4	1.036768	0.036768	3.6767765	2003	3.676776	-0.3
2004	**4**	**10,796.4**	2004	4	1.03147	0.03147	3.1470335	2004	3.40021	-0.3
2005	**4**	**11,107.2**	2005	4	1.028787	0.028787	2.8787374	2005	3.149803	-0.5
2006	**4**	**11,395.5**	2006	4	1.025956	0.025956	2.5956137	2006	3.127967	-0.4



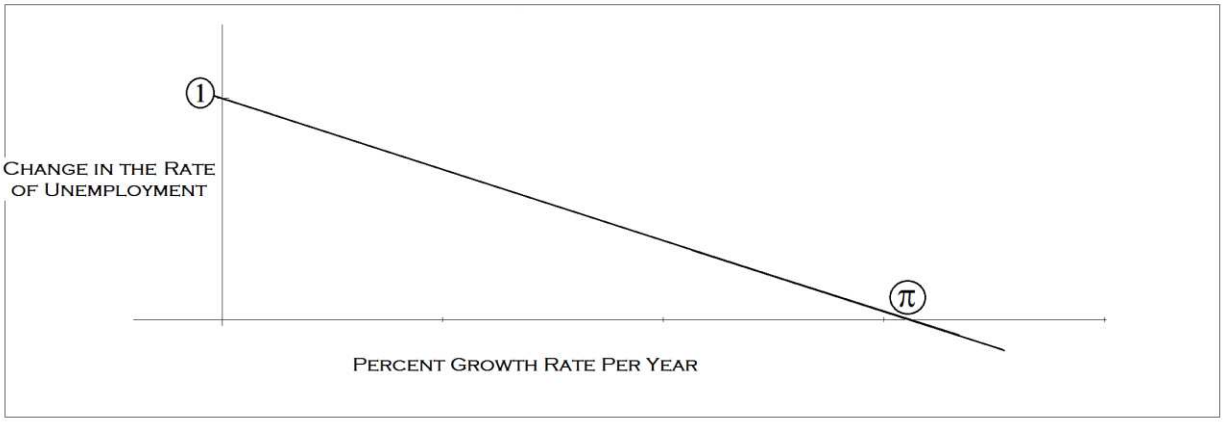
The following states the quarterly data for annualized real GNP and quarterly employment, as contrasted with that of Dr. Knotek.



"The Multiplicative Inverse Surprise"

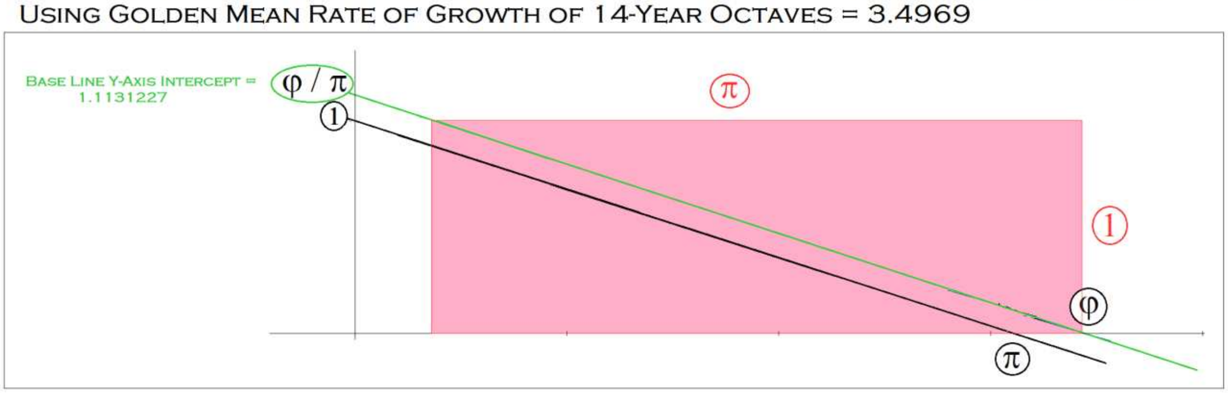
The relationship which we are anticipating is that a 1: π relationship will exist between a percentage change in the rate of unemployment and the percentage growth of GNP. As the rate of growth increases on the x-axis, the rate of unemployment will go down on the y-axis. Setting this relationship as a straight-forward linear relationship, we have the following.

DIAGRAM 2-13.
PI : 1 RELATIONSHIP BETWEEN GNP GROWTH AND CHANGE IN THE RATE OF EMPLOYMENT



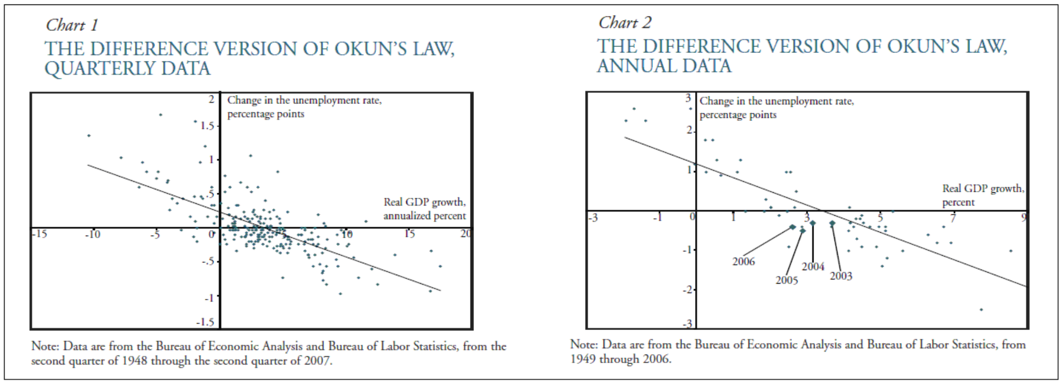
In order to establish a 1 : φ proportion over fourteen years the economy of the United States must possess a steady state rate of growth of approximately 3.4969% per year. As one calculates a 1 : π exchange between rates of unemployment and GDP growth under Okun's Law, one notices that the slope of the 1 : π relationship must remain the same, but that the y-intercept shifts slightly upwards, becoming not "1" but 3.4969 / π = 1.1131227.

DIAGRAM 2-14.
PI : 1 RELATIONSHIP BETWEEN GNP GROWTH AND CHANGE IN THE RATE OF EMPLOYMENT
USING GOLDEN MEAN RATE OF GROWTH OF 14-YEAR OCTAVES = 3.4969



Comparing this to the observed data calculated by Dr. Knotek, one notices that Chart One uses quarterly *growth data* which has been annualized. However quarterly *employment data* is *not* annualized.

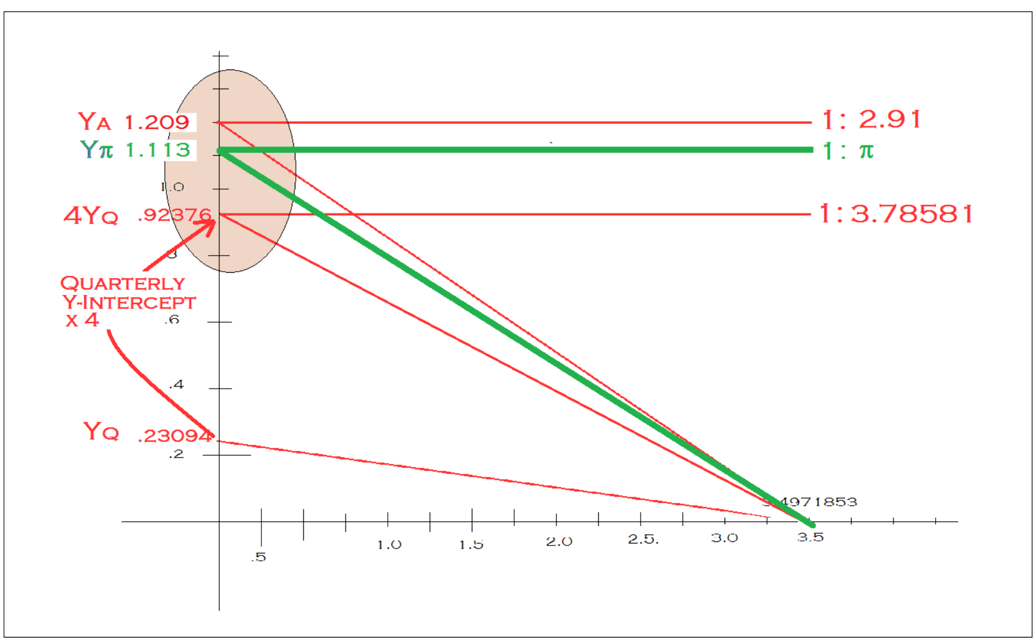
DIAGRAM 2-2.
CHARTS ONE AND TWO OF "HOW USEFUL IS OKUN'S LAW?"



I adjust the trend line for annualized quarterly data by multiplying quarterly employment data by four, thereby "annualizing" quarterly employment data. In this manner annualized quarterly data on growth is matched with "annualized" quarterly data on employment.

DIAGRAM 2-15.
MULTIPLYING QUARTERLY UNEMPLOYMENT RATE X 4

IMPLIED RATIOS BETWEEN
Y-INTERCEPT AND
X = 3.4551266 (ANNUAL X-INTERCEPT)
X = 3.4969781 (GOLDEN MEAN X-INTERCEPT)
X = 3.4972429 (QUARTERLY X-INTERCEPT)

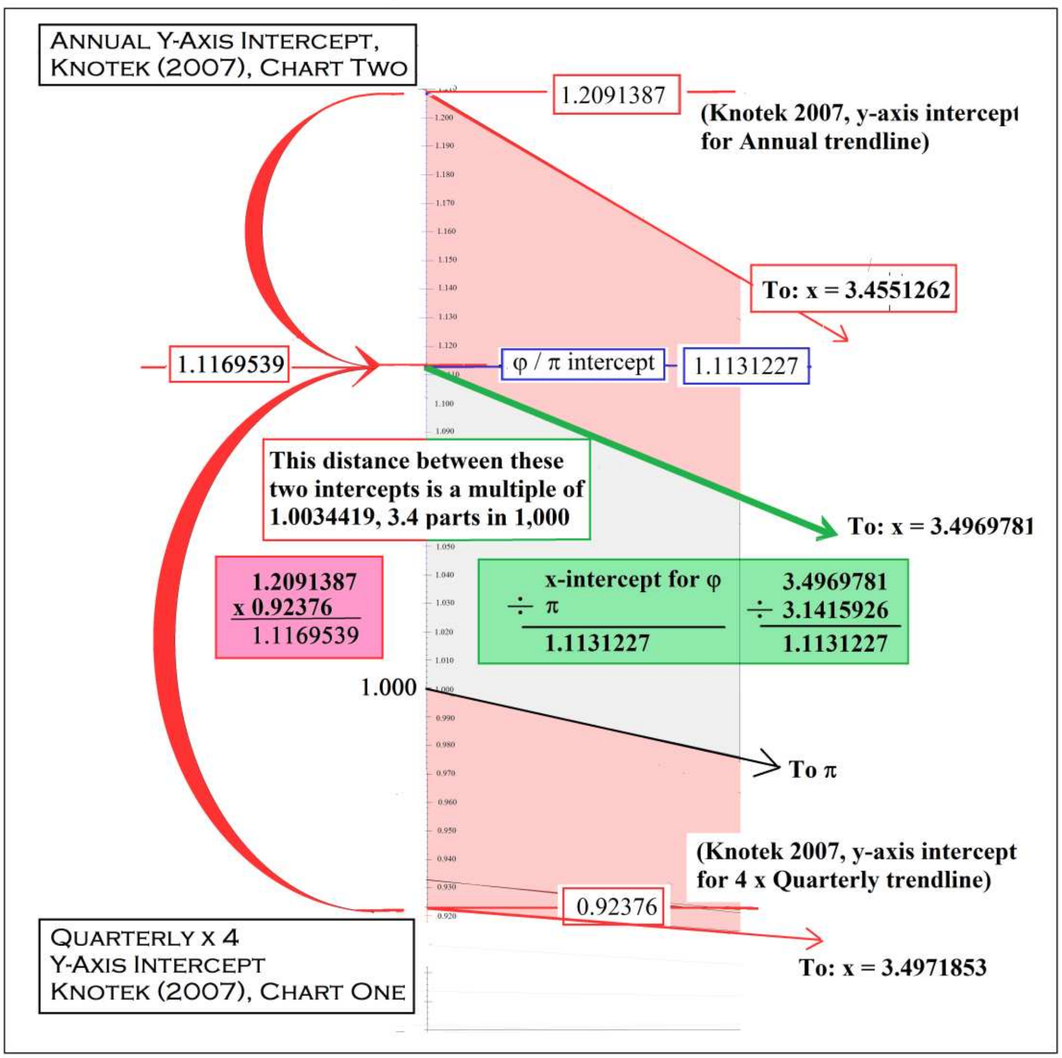


If the steady state rate given for the Golden Mean proportion (3.4969 percent per year) is divided by π, the y-axis intercept is 1.1131227.

If we accept that the "Annual" y-intercept given in Knotek 2007 as 1.2091387, and that the "4 x Quarterly" y-intercept is 0.92376, we may multiply the two in order to test whether they are inverses around a common point. The multiple of these two intercepts is 1.1169539. The result is remarkable.

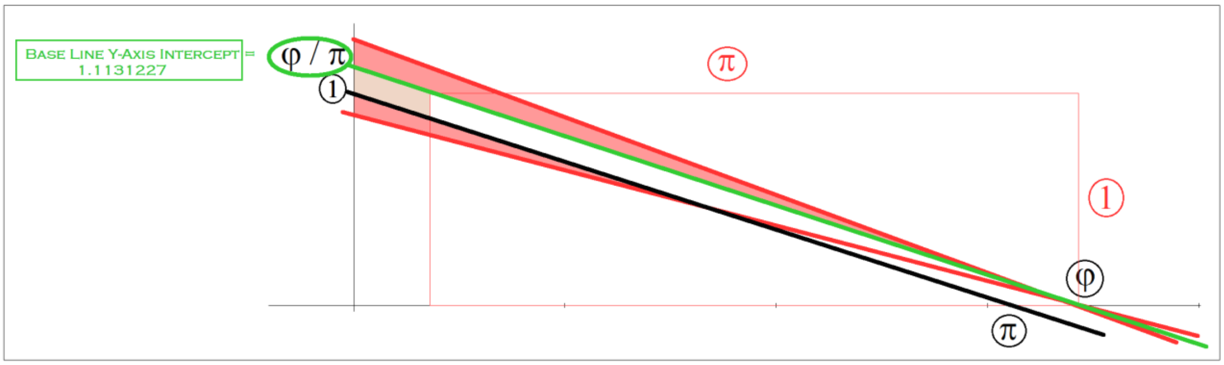
In short when the growth rate is zero (the y-axis), the y-axis intercepts for "Annual" and "4 x Quarterly" unemployment rate create a "Jane Austen multiplicative inverse" about a progenic y-axis intercept equal to the projected trend line connecting a 1:φ steady-state rate of growth with a π:1 ratio for Okun's Law. This calculation is to an accuracy of 0.34%, 3.4 parts in 1,000, or 99.65%. (See chart below)

DIAGRAM 2.18. RELATIONSHIP BETWEEN φ AND π INTERCEPT (IN BLUE) AND KNOTEK'S ANNUAL AND "QUARTERLY X 4" Y-AXIS INTERCEPTS



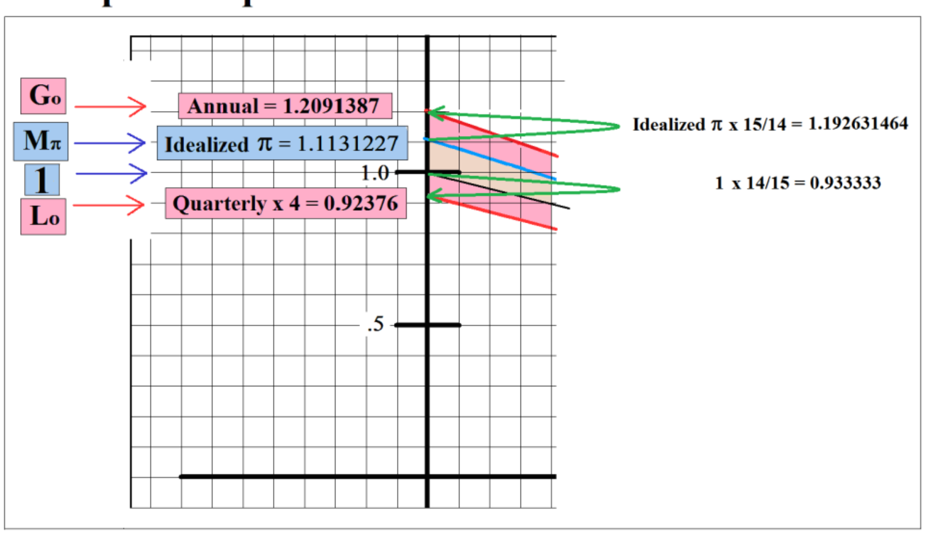
In short, the possibility of two specific sets of numbers – feminine and masculine – as configured in the theory of a Jane Austen multiplicative inverse appears to generate a remarkable understanding of the econometric data underlying Okun's Law.[7]

DIAGRAM 2-20.
PI : 1 RELATIONSHIP BETWEEN GNP GROWTH AND CHANGE IN THE RATE OF EMPLOYMENT
USING GOLDEN MEAN RATE OF GROWTH OF 14-YEAR OCTAVES = 3.4969



The advantages increase considerably if we connect the "1:π / 1:φ" trend line to an analysis of the Kondratiev Wave. We note, as we must, that the progenic π/φ intercept ("P") may be constructed from a feminine "14/15 x 1" as combined with a masculine "15/14 x P." The resulting projections of Annual and Quarterly intercepts lie at variances from Dr. Knotek's calculations of 1.0% (from the Quarterly unemployment y-axis intercept) and 1.3% (from the Annual unemployment y-axis intercept).

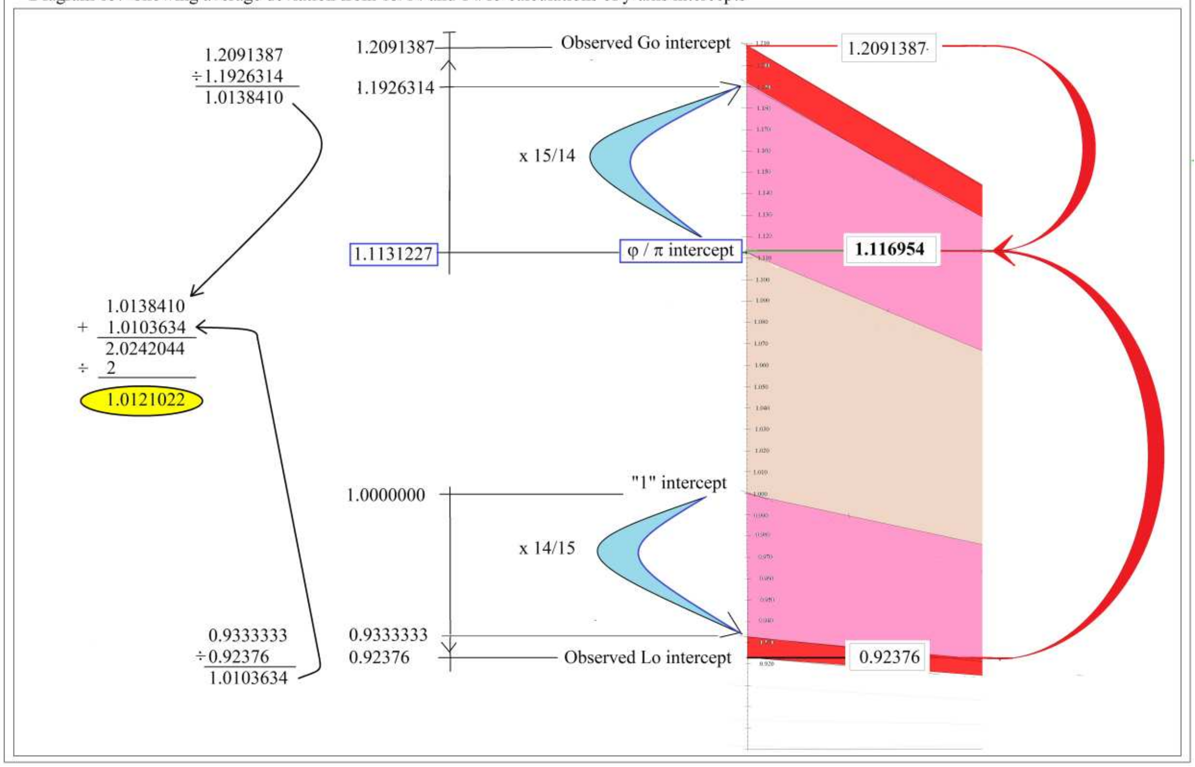
Diagram 11. Greatest x Least = Middle
with span of equivalence around π and 1



[7] A simple 3:1 ratio, with the same approach used, yields a y-intercept of 1.1656. This is contrasted with a π/φ intercept of 1.1131 / 1.1656 (at 95.49%) and an observed intercept of 1.1169 / 1.1656 (at 95.81%).

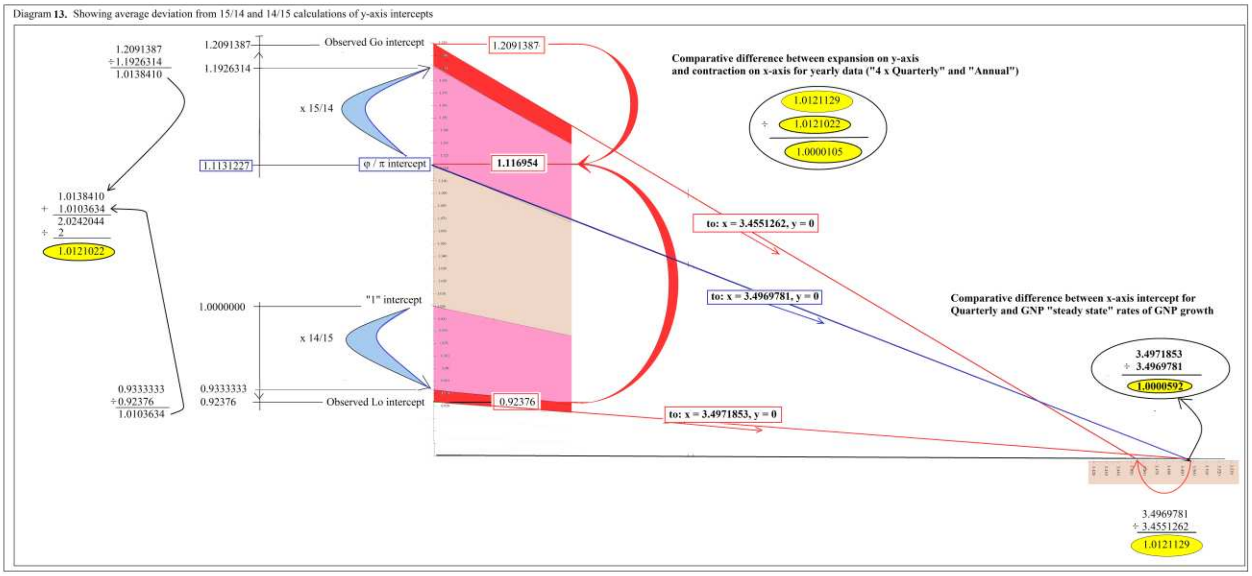
This yields an average expansion of 1.2% beyond the masculine and feminine inverses, or more specifically a multiple of 1.0121022, in yellow below.

Diagram 15. Showing average deviation from 15/14 and 14/15 calculations of y-axis intercepts

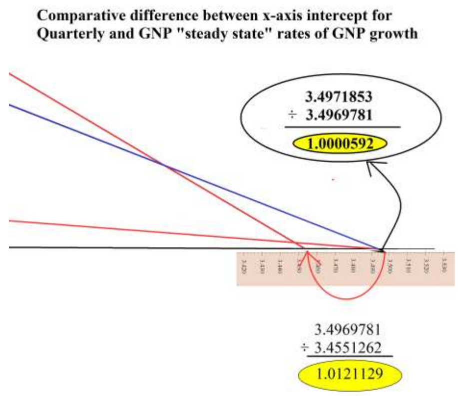


This y-axis deviation balances a similar deviation between growth rates along the x-axis. The steady state rate for Annual Data calculated by Dr. Knotek is 3.4551266. The steady state rate of growth calculated via the GNP Spiral (3.4969781) is greater than this number by a multiple of 1.0121129, virtually identical to the y-axis deviation stated above.

Diagram 13. Showing average deviation from 15/14 and 14/15 calculations of y-axis intercepts



Let us consider more carefully the three rates we have for a steady state rate of growth, each of which constitutes an x-axis intercept. These are Knotek:Annual (3.4551262), Knotek:Annualized Quarterly (3.4971853) and the GNP Spiral (3.4969781).



Dr. Knotek's data track slightly more than one complete circuit around the 56-year GNP Spiral, i.e. covering the second quarter of 1947 through the third quarter of 2007, a period of 60 years. This data misses the full range of GNP values available from the Department of Commerce (1869 through 1946), a period of 78 years. No unemployment figures are available for this period. Moreover between 1869 and 1947 very large growth rates are found in GNP ratios. These larger ratios are included as a part of the calculation of the GNP Spiral.

Despite the incongruity of data sets Knotek:Annualized Quarterly (3.4971853) is virtually the same as that given for the GNP Spiral (3.4969781).

When the larger (3.4971853) is divided by the smaller (3.4969781) a multiple of 1.0000592 is found, indicating a proximity between the two numbers of 5.9 parts in 100,000.[8]

Given the absence of GNP data pre-dating 1947, one might expect that the Knotek:Annual must be smaller than that of the growth rate calculated by the GNP Spiral. Indeed the x-axis intercept for Knotek:Annual (3.4551262) retreats from the expected GNP Spiral x-axis intercept (3.4969781), the second being larger by a multiple of 1.0121129.

As noted previously, this compares to an expansion along the y-axis for unemployment averaging between feminine and masculine components of 1.0121022.

When the deviation along the x-axis 1.0121129 is divided by the deviation along the y-axis 1.0121022 a multiple of 1.0000105 results. This indicates that a balance between growth and employment along a $1{:}\varphi\,/\,1{:}\pi$ trendline is accurate to within 1.05 parts in 100,000. It further suggests that while unemployment states a Jane Austen multiplicative inverse, growth is not figured in such a way.

[8] This result, as first pointed out by Dr. Knotek in an email of June 24, 2011, was the genesis of the correspondence resulting in this paper.

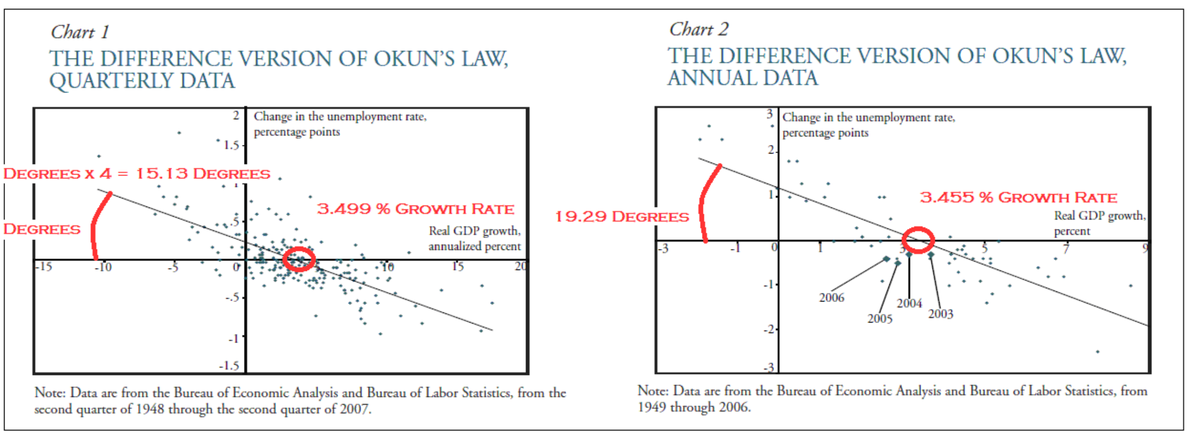
This leads to the following insight as to the operation of the Jane Austen multiplicative inverse and its impact upon the analysis of data surrounding Okun's Law.

When change in the rate of <u>unemployment</u> is zero, the rate of growth is seen clearly; there is no inverse at all to found in the growth data.

When the growth of <u>GDP</u> is zero, quarterly and annual rates of unemployment at in great flux and we see quite clearly the Jane Austen multiplicative inverse in the unemployment data.

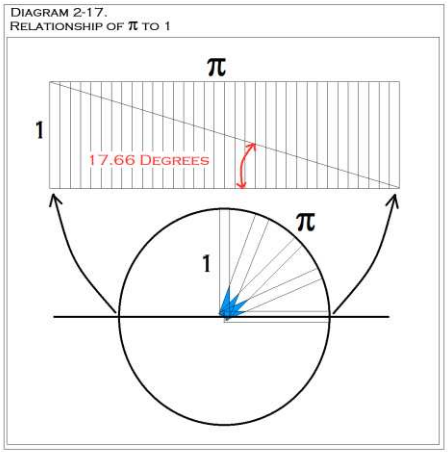
A second test of the Jane Austen Multiplicative Inverse may be found in the fact that the π:1 understanding of Okun's Law generates an angle bisecting that of Charts One and Two to within half a degree. These angles are 15.13 degrees for annualized quarterly data and 19.29 degrees for annual data.

DIAGRAM 2-16.
CHARTS ONE AND TWO OF "HOW USEFUL IS OKUN'S LAW?"



The angle created by the rectangle π : 1 bisects these two within one half of one degree, i.e. 17.66 degrees.

DIAGRAM 2-17.
RELATIONSHIP OF π TO 1



In other words, the slope of the angle bisecting the angles given in Charts One and Two is 17.213 degrees, less than half a degree from the slope of 17.66 degrees of a projected relationship between the constant π and 1 as projected by this approach.

Conclusion

It would appear that Okun's Law is in fact a trigonometrically driven proportion happly demonstrated by a form of number theory engaging the set of feminine (0<F<1) and masculine (1<M) numbers and using the Jane Austen multiplicative inverse as its foundation stone. This view of the relationships is considerably enhanced the central tenets of the GNP Spiral generate masculine (15/14) and feminine (14/15) fractions which can be used to further interpret the interaction of time upon econometric data, however hidden these relationships might appear.

When further we investigate more closely the intriguing use of unemployment data measured in months to derive both feminine (quarterly, circumferential) and masculine (annual, radial) approaches to precisely the same data set, it is neither surprising nor by chance that the balance thereby derived between unemployment and production lies at 1.05 parts in 100,000 of the hoped for marriage between fact, fancy and econometric data.

Unfortunately at present no theoretic structure has been advanced to explain the apparently long-standing and vital macroeconomic / mathematic relationship given by Okun's Law. The possibility of deriving a theory which explains such an important relationship must be of great interest, i.e. What causal precedents underlie such an important rule of macro-economics? ... seemingly one of the few macroeconomic observations to ever be denominated a "law" at all. [9]

For without a theory of explanation for the underlying and virtually exact econometric correlations explored herein we are at the mercy of any who charge that numerology rather than logic and science are at play here. The claim of cargo cult science is sure to be made without a theory of causation, a theory satisfactorily explaining to the pygmy why his heathen and mystic incantations will or will not bring the GI, his plane, his emergency landing and his gifts back again.

The answer to this question will be presented in a separate paper.

Scott A. Albers
February 25, 2013
Great Falls, Montana

[9] See in this regard (Owyang and Sekhposyan, Okun's Law over the Business Cycle, Was the Great Recession All That Different? Federal Reserve Bank of St. Louis Review, September / October, p. 399, 2012) "Many macroeconomic textbooks contain a rule of thumb relating real output growth to changes in the unemployment rate. This relationship, called Okun's law after Okun (1962) typically assigns a 2- to 3- percentage point decrease in real gross domestic product (GDP) growth to a 1-percentage point increase in the unemployment rate. Unlike laws in the physical sciences (e.g. Newton's laws of motion) Okun's law is an (arguably loose) empirical correlation and is, in general, neither theoretically motivated nor strictly adhered to in the data. As many of the reduced-form relationships build strictly on associations and not causation, Okun;s law appears to vary depending on the sample period studied."

Bibliography

Albers, S. and Andrew Albers, (2011). ‘The Golden Mean, The Arab Spring and a 10-Step Analysis of American Economic History,’ *The Middle East Studies Online Journal*, August 2011, issue 6, volume 3, pp. 199-253.

Albers, S. and Andrew Albers, (2013). ‘On the Mathematic Prediction of Crises: Towards a Harmonic Interpretation of the Kondratiev Wave,’ *Entelequia*, Spring, 2013.

DeSalvo, J. PhD (2008). *Decoding the Pyramids*, Metro Books, New York.

Dunn, C. (1998). *The Giza Power Plant, Technologies of Ancient Egypt*, Bear and Company Publishing, Santa Fe, New Mexico.

Euclid of Alexandria, Elements.

Goldstein, J. (1988). *Long Cycles: Prosperity and War in the Modern Age*, Yale University Press, New Haven, Conn.

Hemenway, P. (2005). *Divine Proportion, Phi In Art, Nature and Science*, Sterling Publishing Company, New York, NY 10016.

Knotek, E. (2007). ‘How Useful Is Okun’s Law?’ *Economic Review*, Kansas City Federal Reserve, Issue Q IV, pp. 73-103.

Kondratiev, N. D., *The Major Economic Cycles* (in Russian), Moscow, 1925; translated and published as *The Long Wave Cycle* by Richardson & Snyder, New York, 1984.

Korotayev, A. V. and Sergey V. Tsirel, (2010). ‘A Spectral Analysis of World GDP Dynamics: Kondratieff Waves, Kuznets Swings, Juglar and Kitchin Cycles in Global Economic Development, and the 2008–2009 Economic Crisis,’ *Journal of Structure and Dynamics, Social Dynamics and Complexity*, Institute for Mathematical Behavioral Sciences, University of California at Irvine.

Livio, M. (2002). *The Golden Ratio: The Story of the World’s Most Astonishing Number*, Broadway Books, New York.

Owyang, M and T. Sekhposyan, ‘Okun’s Law over the Business Cycle, Was the Great Recession All That Different?’ *Federal Reserve Bank of St. Louis Review*, September / October, p. 399, 2012)

Rucker, R. (1983). *Infinity And The Mind, The Science And Philosophy Of The Infinite*, Bantam Books, December 1983;84-88.

Schumpeter, J. A. (1939). *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process*, New York and London: McGraw-Hill Book Company, Inc.

Sethares, W. A. (1992). “Relating Tuning and Timbre,” *Experimental Musical Instruments,* September 1992.

Skinner, S. (2006). *Sacred Geometry*, Sterling Publishing, New York, NY. 10016.

Tobin, J. (1983). “Okun, Arthur M.” *The New Palgrave Dictionary of Economics*, Vol. 3, pp. 700-701, Macmillan, London.

Tompkins, P. (1971). Secrets of the Great Pyramid, Harper and Row, Publishers, New York.

Historical Statistics of the United States: Colonial Times to 1970, Part 1, United States Department of Commerce, Series F 1-5, "Gross National Product" for the United States between the years 1869-1970 according to 1958 prices.

See also the figures for Real GNP, 1947 to present, maintained by the St. Louis Federal Reserve at http://research.stlouisfed.org/fred2/series/GNPC96.

