FIBONACCI SUMMATION ECONOMICS PART II*

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Elliot's observations have alerted us to the possible existence of untouched fields of Fibonacci summation principles relating to economic prediction. Dependence upon coincidence and seemingly unrelated facts invites error. An attempt to induce orderliness into the investigation will be made. When reasoning has gone as far as possible at the moment a working model consistent with the products of the fledgling reasoning will be constructed which model, if it works, provides some evidence that the reasoning might not be sufficiently erroneous to discard. To induce this orderliness parallel topics will be developed to a degree such that they can later be fused to purpose. These topics are:

1. What cycles have been observed?
2. What relationships, if any, do these cycles have to the Fibonacci sequences?
3. What other apparent co-incidences exist that might be related to the problem?

1. WHAT CYCLES HAVE BEEN OBSERVED?

The source for these cycles is relatively incomplete for at the time this article will appear in print there will have been published a complete compendium of cycles identified to date by the Foundation for the Study of Cycles. Partially completed data shows a list of cycles in many phenomena which on superficial examination bears no relation to Fibonacci series but when arranged into subgroups consistent within themselves do in fact show some tendency toward summation relationships. Some larger cycle groups show two or more summation relationships but with different time periods.

Notably there are $17\frac{1}{2}$ week cycles in industrial stocks and electrical potential of trees, 5.9, 12 and 13 month cycles in industrial stocks; a 12 month or 13 lunar month cycle in many phenomena including industrial stocks, some commodity prices, ratio of male to female

*Refer to Part I, Fibonacci Quarterly, December 1964, page 320.

conceptions, sleep characteristics, beef cattle prices, egg laying of domestic fowl, incidence of puerperal sepsis; a 17.8 month cycle in industrial stock prices, a 21 month cycle in rainfall in the Great Lakes region; a two year cycle in industrial stock prices, Great Lakes rainfall, sunspot numbers and Nile River floods; a grouping around 34 lunar months of such cycles as residential construction contracts, copper commodity prices, pig iron prices, automobile factory sales, Canadian Pacific Railway revenue ton-miles, Great Lakes rainfall, rayon production, some individual company sales, motor car and truck sales, department store sales and copper company share prices; a 3 year cycle in factory sales of passenger cars; a 3.2 to 3.4 year grouping in stock prices, bank clearings, copper share prices, general business conditions, pig iron production, factory sales of cars, atmospheric electricity, business failures, cocoa bean prices, and the solar constant; there is a 4.2 to 4.4 year or roughly a 55 lunar month cycle in company sales, temperature, industrial common stock, railroad stock prices, advertising effectiveness, European wheat prices, pig iron prices and Great Lakes rainfall.

There is an impressive group of cycles clustered within the 5.90 to 5.96 year period including the one fifth sidereal period of Saturn, liabilities of business failures, railroad stock prices, sunspots with alternate cycles reversed, sunspots, the combined index of stock prices, copper, cotton and pig iron prices, coal stocks, tree ring size, wheat prices and barometric pressure.

There is an 8 year cycle in cotton prices, cigarette production, lynx abundance, pig iron prices, rail stock prices, crop yields, bird abundance, industrial sales, rainfall, wholesale price index, steel ingot production, sunspots with alternate cycles reversed, wheat prices, an 8.8 to 9.6 year cycle in sunspots, widths of pre-glacial tree rings, pig iron prices, numbers of cattle raised, wholesale commodity prices, various stock price categories, grasshopper abundance, auto production, British Consol prices, business activity, copper prices, industrial, railroad and combined stock prices, liabilities of commercial and financial failures, manufacturing production, new members of Protestant churches, pig iron prices, manufacturing sales, current

tree ring widths, wool prices, business failures, patents issued, cotton prices, abundance of marten, rabbits, lynx, foxes, ticks, wolves, acreage planted to wheat, Atlantic salmon and other fish abundance, human heart disease incidence, India rainfall, lunar cycle, ozone at London and Paris and tent catepillars; an 11.4 to 11.8 year cycle in rainfall, twin and genius births, infectious disease incidence, sex ratio of male to female births, slenderness of newborn, sunspots, and in the number of international battles.

There is an immense group of cycles whose periods lie between 17.0 and 18.3 years and some of whose exact length has been worked out accurate to two decimal places. This group includes the Smithsonian solar constant, rainfall figures, cattle prices, mean temperatures, building construction, real estate activity, population, common stock prices, wheat prices, sunspot numbers reversed, Nile floods, earthquakes, pig iron prices, cycle in the variable star Scorpius V, in war incidence, Arizona tree ring, business failures, cotton prices, international battles, and in civil war, sunspots with alternate cycles reversed, advances and recessions of glaciers, immigration, Java tree rings, sales of a public utility company, common stock lows, Canadian Pacific Railroad freight traffic, furniture production, loans and discounts, lumber production, financial panics, pig iron production, marriages, sunspots with alternate cycles reversed, and wheat acreage inverted.

There is a 34 to 36 year grouping which includes cycles in European harvests, U.S.A. Immigration, plant and tree growth in Europe, European tree ring thickness, lynx abundance, earthquakes in China, European weather, frequency of the Aurora Borealis, European barometric pressure, manufacturing production of the U.S.A., prices of British Consols, and European wheat prices.

A 42 year cycle exists in agriculture and related phenomena including tree ring widths, cotton prices, wheat prices, and sunspots.

A 55 year cycle exists in industrial and related phenomena including German coal production, various English, French and U.S. industrial statistics, worldwide pig iron and coal production and railroad stock prices. There is also some reflection in European wheat

prices and tree ring widths. Finally there is a 67 and 144 year cycle in international battles.

When individual phenomena are investigated a number of cycles have already been identified. Railroad stock prices show cycles of 4.4, 5.9, 5.92, 6.4, 7.95, 8.39, and three cycles of 9.18, 9.20, and 9.30 years, $18\frac{1}{3}$ years and 55 years. Pig iron prices show 2.7, 4.4, 5.91, 6.3 to 6.5, 8, 8.9, 9.0, to 9.3, 9.2, 17.69, 17.75 years. Copper commodity prices show 2.7, 5.91, 9.0 to 9.3 year cycles. Coal production and coal stocks show 5.91, 8.0, 17.75 and 55 year cycles. Sunspot numbers with alternate cycles reversed show 5.9, 5.91, 8, 17, 17.3, 17.66, 17.75, 18.33 year cycles. Factory sales of cars show 2, 2.72, 2.75, 3, 3.4 year cycles and 6.3 to 6.5 year cycles. Cotton prices show 2, 5.91, 6.3 to 6.5, 6.9, 7.44(89 mos.), 7.88, 7.91, 7.95, 8.42, 9.47, 9.65, 11.3, 12.7 to 12.9, 14.27, 17.25, 17.75 and others peaking around 21, 42 and 89 years. Industrial stocks show cycle groups averaging 21, 55, and 89 weeks, 3, and 3.4 years, 42 and 55 months, 5.91, 5.90, 9.0, 9.2, 9.3 years, 17.2, 17.3, 17.7 years and three cycles of 18.33 years in length. Copper share prices show roughly a 34 and 42 month cycle. Sunspot numbers show a 2.0, 5.91, 8.76, 8.8, 8.94, 9.0 to 9.3, 11, 11.5, 18.2, 22, 22.75 and 42 years. Wheat prices show a 55 lunar month cycle, 5.96 year, 8, 9.0 to 9.3, 17.3, 34 to 36, 42, 42.5, 54, 55 year cycles. Tree rings show 5.91, 5.93, 6.3 to 6.5, 9.0 to 9.3, 17.75, 18.2, 35, 42 and roughly 55 year cycles. Great Lakes rainfall shows a two year group, and also a 21, 34, 42 month average group, and a 55, 89 and 144 month cycles. Earthquakes show 17.5 and 35 year cycles.

2. WHAT RELATIONSHIP IF ANY DO THESE CYCLES HAVE TO FIBONACCI SEQUENCES?

At first glance, none. On closer examination the 1, 2, 3, 8, 21, 34, 55, 89 and 144 unit length cycles speak for themselves, but the apparent anomales of 4.5, 5.91, 9, $17\frac{1}{2}$ to 18 and 42 unit length cycles must be explained. No shortage of reasonable explanations exists yet to be sure of the right one implies more understanding of the underlying principles then we have at the moment.

Should these cycles interact with one another they might summate at their mean. The 5.90 to 5.96 year cycle is roughly 72 months which is the mean between the 55 and 89 month cycles. The 4.5 year cycle is both half of the 9 year cycle and nearly equal to a 55 month cycle. The 5.91 year cycle is roughly both 1.618 times the 42 month cycle and 0.618 times the 9.3 year cycle. Interestingly, if the cycles are plotted from the same starting point on a graph in the form of sinusoidal waves it is noted that the 13 and 21 unit and the 34 and 55 unit cycles will summate to zero every $17\frac{1}{2}$ and 42 units respectively. A 21 and a 34 unit cycle never do summate to zero, whereas a 21 and a 55 unit cycle will maximize at 5.9 and summate to zero at $17\frac{1}{2}$ units. In addition, the 17+ unit cycle might be half of a 34+ unit cycle. The explanation for the 9+ year group is not so simple. It might be half of an 18+ unit cycle, such as that of the solar constant or it might be double the 55 month or $4\frac{1}{2}$ year cycle, or as mentioned above 1.6 times the 5.91 year cycle. Investigation of these anomales can become complex but seem to retain internal consistency. For example there have been identified 6, 12 and 13 month cycles in stock prices. If these were set in motion to summate we would have

A) 6+13=19 19+13=32 32+19=51 51+32=83 months

B) 12+12=24 24+12=36 36+24=60 months.

Now 83 and 60 months averaged together amount to $71\frac{1}{2}$ months, or 5.91 years.

3. WHAT OTHER APPARENT COINCIDENCES EXIST THAT MIGHT BE RELATED TO THE PROBLEM?

Wesley Mitchell in his book Business Cycles: The Problem and its Setting came to the conclusion after compiling an exhaustive correlation of business cycles with every conceivable proposed cause that the only phenomenon with which there is any reasonable correlation is that of sunspots. The similarity between sunspot cycle length and the length of a number of economic cycles has at the least called our attention to the possibility of such a relationship being in some way

involved with celestial mechanics. If event groupings which are cycles were bunched together by energy due to planet polarity interaction it would not pay to reject the possibility out of hand before the following was considered. Angular momentum of a polarized planet rotating within a solar magnetic field could like a generator produce predictable amounts of energy to affect any number of factors including sunspots and weather which correlate well with cycles observed. Concerning unit energy production by rotational angular momentum through the celestial field it is to be noted that the angular momentum involved in the diurnal earth rotation is

$$5.91 \times 10^{40} \ \frac{\text{gm.cm.}^2}{\text{sec.}},$$

the angular momentum of the earth moon system rotation is

$$34.4 \times 10^{40} \ \frac{\text{gm.cm.}^2}{\text{sec.}}$$

and that of the earth's orbital motion around the sun is

$$42.31 \times 10^{45} \ \frac{\text{gm.cm.}^2}{\text{sec.}}.$$

There may be exposed now the starting point for an orderly investigation of a new system of quantitative economic prediction. The purpose in presenting the information herein is to enlist the aid of investigators trained in a different discipline than the author's, and it is felt that the Fibonacci Quarterly Journal is an ideal means of communicating with them.

On that account enough material has been presented initially to provide some guidelines concerning where solutions may lie while for the moment restricting description of the author's approaches which might prejudice an independent and more systematic start by others.

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