Golden Warming

by

George White

The golden ratio is a constant that shows up throughout nature from plants to galaxies. It's also called the golden section and is the limit of the ratio of consecutive elements of the Fibonacci series. What makes this ratio golden are its unique numerical properties. One of these is given by,

$$g = 1 + 1/g$$

Solving this equation for g results in two possible values,

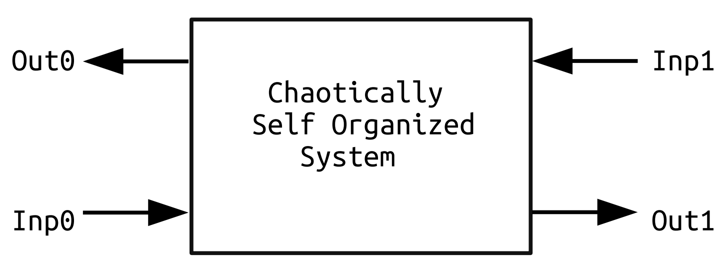
$$g = 1.618034...$$
$$g' = -0.618034...$$

The following are just a few of the relationships unique to the golden ratio:

$$g = 1.618034...$$
$$1 + 1/g = 1.618034...$$
$$g^2 - 1 = 1.618034...$$
$$g^3 - g^2 = 1.618034...$$
$$g^4 - g^3 - 1 = 1.618034...$$
$$g^5 - g^4 - g^2 = 1.618034...$$
$$1 - g' = 1.618034...$$
$$-1/g' = 1.618034...$$

There are an infinite number of equations involving g and powers of g that will result in g making it the most self consistent number there is. This is the only number that has this property and the infinite number of ways to calculate g as a function of g leads to why this is such a likely value to arise out of chaotic self organization.

To see how the golden ratio can emerge from chaos, consider the following self organized system:



For steady state conservation constraints of Out0=Inp0 and Out1=Inp1, where Out0 is not necessarily equal to Out1 and the system has no internal sources of input, the instantaneous or average system can be quantified by a single value, G, such that,

Out0 = Inp1 / G
Out1 = Inp0 * G

When $G > 1$, Inp0 is amplified by a factor of G to produce Out1 and for both conservation constraints to be met, Inp1, which is equal to Out1 must be attenuated by 1/G to produce a value of Out0 equal to Inp0. For G between 0 and 1, the roles of amplification and attenuation are reversed.

both outputs are dependent on both inputs, so another set of equations representing this constraint must also be consistent with the conservation constraints. The normalized form of these are as follows:

Out0 = a0*Inp0 + Inp1
Out1 = Inp0 + a1*Inp1

For a0=1-G and a1=1-1/G, these two equations are equivalent to the constraining equations for all G.

By changing a0 to -1/G and/or a1 to 2-G, the equations get the same results as the constraints, but only when G is the golden ratio, g. Given the unique property of an infinite number of ways to calculate g as a function of g and that both a0 and a1 are functions of G, there are an infinite number of possible values of a0 and a1 which in any combination are consistent with the constraints, but only when G=g, moreover; as G deviates from g, each combination of a0 and a1 deviates from the requirements of the constraints in a unique manner.

The nature of this self organized system is that G is chaotically varying, so no matter how far from the golden ratio G is driven or what behavior pushed it away, one of the infinite possible functions quantified by a0 and a1 will describe that behavior exactly and drive the system back towards a golden value of G. The chaos is maintaining a self organized system in a state quantified by the most self consistent number.

Applying this to the atmosphere, on the outer space side, Inp0 is the incident solar energy and Out0 are the emissions at TOA. On the surface side, Inp1 are the radiant emissions of the surface consequential to its average temperature and Out1 is the power replacing those emissions. The chaotic self organization of the atmosphere is manifested by clouds which locally and globally modulate G.

Latent heat and other non radiant energy can be ignored because whatever effect they plus their offset to the surface has is already accounted for by the average surface temperature and its emissions. If a Joule leaving the planet happened to originate from latent heat, a Joule of surface emissions that would have been emitted into space must be returned to the surface to offset the latent heat that escaped.

The Inp0 value for the Earth has a non controversial average of about 240 W/m^2, which is equivalent to a temperature of about 255K. The average yearly temperature of the Earth over the last several decades has been about 288K, corresponding to a Inp1 of about 390 W/m^2. Since G = Out1/Inp0 and in the steady state, Out1=Inp1, thus G = 390/240 = 1.625. This result is within 0.5% of the value predicted by the golden model and is a first order confirmation that this model isn't obviously wrong.

The model implicitly includes what's on either side of the self organizing system, so if it's divided into columns that include surface, atmosphere, space and a sufficient amount of chaos, the same ratio should emerge in every column. Weather satellite data shows that this ratio quickly converges to within a few percent of the golden ratio for slices of latitude from pole to pole, further lending support to the golden model since the same coincidence can't be happening everywhere at all times. In regions where this ratio deviates from a larger fraction, nearby latitudes tend to offset it.

A more in depth discussion of the math can be found here: http://www.palisad.com/co2/chaos2gold.pdf

How it applies to the climate is discussed in more detail here: http://www.palisad.com/co2/gbm.pdf