Universal Temporal Scaling

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Abstract: Money is being portrayed as temporal access to energy and a new methodical approach to the energetics of the human economy is introduced. The economic evolution of world system energetics is put into the historical focus of all global monetary civilization, reaching back to the Sumerian city states. This long wave energetics of human economic action clearly points to the biophysical boundaries of the monetary production economy which is also based on natural law. The future perspective of a new socio-energetic order is discussed as a cognitive adaptation or learning process, responding to entropic volatility; the economic realization and entrepreneurial management of a new long wave dynamics via eco-energetics, bio-tech and health science, guided by the creative technical extension of the human brain via artificial intelligent systems, will most probably reach the historical momentum of tech-know-logical singularity, i.e. the fractal dimension of industrial economics in quantum space-time transforms globally into a new temporal interval as the space-scale changes. Finally, the spontaneous self-organization of human civilization developed via fractal process stages out of natural chaos.

Keywords: entropy, energetics, money, ecology, civilizing process, long wave cycles, economic history, temporal scaling, fractals, chaos theory, quantum space-time, self-organization, singularity.

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The social paradox of economic systems is hidden in the temporal interplay and cyclical interaction of objective natural limits (space) and subjective human decisions (time); every calculative counting, formula or equation is a rationalized accounting method of bio-economical finitude and the recorded history of economic systems evolution is naturally not the artificial product of the perpetual motion of firms, households and financial intermediation. At every evolutionary standard of technological innovation, the social economy really converts natural resources into human needs by investing energy for an energy return or a net energy gain, i.e. human societies are evolving energy transduction systems. However, in a monetary production economy all human needs are simplified, reduced and measured in monetary units, i.e. the advanced market economy is based on monetary exchange as market replicator and information signal for future production and price formation. Therefore, human economic production is based on the following sequence of process functions:

A: Time/quantizes/production;

B: Energy/quantizes/time;

C: Money/quantizes/energy.

ABC: Money is=access to= energy and quantizes economic production time, i.e. the space scale; in addition, human resources (skills, knowledge, ingenuity) cannot outperform the natural forces or biophysical laws of economic production that are based on a gross energy input for a net energy output (via optimal temporal gain). Social history documents that progressive monetary exchange has expanded gradually the limits of the natural production economy on a global scale, but it cannot expand the natural limits of the known physical energy resources (natural systems organization of human civilization). It is not an exaggeration to assume that the origin of the wealth of nations is derived from access to energy resources and that the dynamics of entropic processes decides over efficiently maintaining the social order of economic systems. Many competing economic taxonomies (for a return on production factors) and social utopias (of an ideal society) are implicitly in academic circulation, being only rivaled by smart voiced political ideologies (of best practice), but the dominant majority of economic models concerning human societies consequently ignore the empirical evidence of the biophysics or energetics of the modern monetary production economy; this scientific deficit is especially dangerous in our globalized village as the effective range of disaster is now planetary.

The decisive economic problem of our current monetary system is that money does absolutely not behave neutral or boring to the production cycle; the commercial fiat emission of private credit (x interest) reaches after a certain temporal limit its biophysical or energetic boundaries.

Whereas credit (x interest) can be emitted by private banks on the basis of central bank fiat money mathematically (as a political wish coupon), the energetics of the production system is limited physically by natural law (entropy). Consequently, the monetary basis needs an optimal or narrow reserve requirement to speed down human over-consumption of natural economic resources because money means practically access to energy. The next leadership economy will surely be about solving the money-energy-relationship via a slowdown temporal scale; a novel period of energy use, based on access to comparatively not expensive energy resources, will signify a new systemic leadership position as an economic avant-garde. The long wave perspective in economic history documents that new systemic leadership in energetics never evolves from the supreme political economy, because the most powerful factor of systemic supremacy is the energetics of weaponry. De-central energy provision, energy saving and renewable (clean) energy resources will open the door to this new wave of energetics, in combination with sound monetary reform for temporal sustainability and economic dynamic efficiency. It is this vital interplay of energy, money and time that governs the economic production cycle and provokes human ingenuity to solve a new social problem- generation, i.e. to set new standards in the energetics of the human economy. It is very probable that these process changes in system energetics are traceable back to the historical economics of the first monetary civilization, i.e. the Sumerian city states, and that the long-term evolution of the whole civilizing process is about socio-energetic transduction systems, guided by monetary prudence or error, measurable via temporal scaling.

Humankind is a drop out from nature, but economic action cannot outperform the natural boundaries although every human economy is a result of the unnaturalness of the human nature. This is the key of the economic paradox: subjective preferences are limited by the energetic input on a temporal scale for an energetic output (remember the above mentioned ABC). Today, this is a global process as the monetary production economy, based on energetics, is the dominant world system. It is therefore wise to think global economics as world system energetics; advancing human large-scale economic cooperation and small-scale group dynamics on this globe will depend on a new energy science that applies economic wisdom (time-tested knowledge) and monetary foresight, leading most probably to a new world currency, based on a clean energy index. This fundamental global energy shift of the world economic system calls for a methodical integration of ecology, energetics and economics, with the monetary system reflecting the natural limits of human economic action as money is actually temporal access to energy. Thus, the empirical application of natural law is the cultural foundation principle of every human social economy; however, the applied technology of any recorded human civilization cannot be interpreted or read as simple textbook physics, but follows systemic processes of higher organic order (Deutero-Learning), i.e. spontaneous self-organization. Furthermore, civilized men may behave wise and experienced, but external factors, not accessible by empirical rationalization, can naturally force already established populations to leave their cultivated territory. Meaning essentially implies our view of nature and is all about the construction principles of reality, e.g. natural forces can be interpreted as unified power or as an assembly of powers. The method of scientific research aims at observing and measuring regularities or repetitive laws of events in nature and society. It can be easily understood that the first human civilizations were products of water management techniques at great rivers (Indus, Yangtze, Nile, Mesopotamia), evolving around 3000BCE, but only the Sumerian city states developed a monetary market economy. However, climate change around 2000BCE eventually brought a long lasting drought to that

region, nomads destroyed the capital of Ur and the whole area depopulated by 90% within two centuries; the biblical account of Avram falls exactly into this period of time; in any case, the monetary unit of shekel (11gram of silver=180 grains of barley) survived via Babylon. The ancient Greek civilization of the Mediterranean port cities was also a water-based monetary economy, with maritime markets for agricultural products and long-distance credits for shipping (500BCE). Song China at 1000CE was again an advanced water-managed civilization and monetary market economy, with coins, limited paper money for long-distance trade and credit; after an energy crisis, it was the Mongol nomads that put an end (1300CE) to this proto-industrial upswing, not being knowledgeable about monetary economics and water-based technology. Accordingly, Newton was not born in China. The Italian maritime republics (1100CE) invented an advanced financial system and their energy management was again dependent on water and wind. Iberian ship development (1400-1600CE), based on wood, was the technical invention for all maritime powers that followed by history and the Dutch Golden Age (1600CE) was again a water-powered cultural enterprise; finally the industrial revolution (1750CE) switched the energy power base of the human economy to coal. This methodical array of big history data looks like a random network sample and focuses on global impacts, but let us study the EROI (ratio of energy return on energy invested=net energy gain): hydro power almost yields 100%, coal over 80%, oil about 30% and wind about 20%. The most disturbing fact in this picture is that natural factors (e.g. climate) and human factors (e.g. warfare) do alter the rational EROI orbit; unfortunately, there is no beauty in such socio-natural events and logical disharmony or existential paradox is prevailing. In any case, the ABC of our economic process functions is applicable as bounded rationality, i.e. globalization is monetary civilization, energy is decisive and production is temporal. In economic history, long wave cycles are not equal to arithmetic counting or linear conclusions; on the contrary, non-rational forces can easily outperform rational management, i.e. chaos theory is a serious research subject and every human civilization has steadily evolved against external or internal chaos as socio-natural event. The future dynamic efficiency of the human social economy is not in romantic equilibrium, but in the real building up of a clean energy transduction system that reduces the entropy of the economic order (quantum economics). This is a matter of cognitive adaptation and learning, of cultural naturalism and physical spirituality ('spiritual physics'); the cosmology of space-time structures in world economics, the biophysics of socio-economic systems and quantum wave theory of the human existence are the essential intelligence tools for coping with the brutish facts of natural reality, because death, disaster and disease are real; the future of the human race will depend on this kind of Deutero-or process learning ('doing by learning').

From all these details follows that the temporal process momentum of quantum space-time for the natural laws, biophysics and energetics of socio-economic systems slowly appears on the cognitive radar of any serious approach to world economic science, i.e. the spatial and temporal intervals of human economic action are socio-dynamic parameters of systems change: the time flow changes proportionally to the space scale. Our above outlined path of human economic history resembles a scale-free network, pointing to some decisive tech-know-logical hubs (statistical degree distribution at definite geophysical points=fields), but the observable chronic wave frequency (since 1750CE) seems to be a topological exception from the last 5000 years, technically initiated by the economic use of fossil and nuclear fuels. The 5 long wave cycles of the last 250 years have fundamentally altered the heartbeat rhythm of 'the

economic animal' and finished the fractal nature of traditional nomad and agrarian economics; is the so called 6th Kondratieff (since 2001) of eco-energetics, bio-technology and health science, propelled by the technical extension of the human brain by artificial intelligent systems, actually the quantum leap into the great 3rd wave of technological singularity as J. Neumann imagined? We do think this will depend on a new kind of energy science, the economic abolishment of the 'monkey money illusion' and temporal connection by electronic communication. This space scale integration of global wave compression changes the planetary time flow and is indeed in need of an intelligent operation system for information-processing; otherwise, the energy trap or gap closes as in Sumer (draught) or Song China (deforestation, paving the way for nomad invasion). W. Heisenberg taught us that to study natural science is a dynamic quantum process between men and nature, not a static accounting chart, i.e. the wave cycle frequencies alter in the long spiral course of economic history, the temporal nature of the wave frequency changes by space scale inter-connection and is highly energy intense. Speaking about economic wave changes as frequency alteration in quantum space-time means to identify the exact transformations of fractal replication in human action on a temporal scale. Entropy is the natural enemy of humanity; this refers both to the increasing entropy of a single human body and to the body of humanity as a whole; the fractal dimensionality of human history reveals a regular pattern of wave-like breakdown in the civilizing process, mainly owing to energetic mal-economy regarding natural resources. However, as we stated earlier, even prudent behavior cannot exit us fully from the Damocles sword of disastrous annihilation and natural disasters; it is by any ethical accounting method unreasonable to assume that natural disasters as floods, droughts, ice peak or interglacial ages and the like are collective results of human guilt acts, committed against the higher will of an eternal upper force. On the contrary, human civilization is a competence building process against the already experienced blind random hits from Mother Nature. From this viewpoint, it is indeed wise to extend human intelligence via technical cognition and to develop a technical operating system for the intelligent advancement of global human civilization, paying special respect to the economic relation of time, energy and money (remember: time flow=money and space scale=energy change proportionally/in the quantum space-time of production), i.e. the economic process functions are not fractal but chronic periodic frequencies. In any case, the temporal interval units in space are shortening with the long spiral course of earthly history as modern physical cosmology explains, because matter moves with energy and time moves with light in spatial universality (by relative backward motion). It goes without saying that traditional schools or academies are not the best places for the human development of creative technical intelligence; such a dynamic process is always the creative economic product of entrepreneurial management power where learning dominates knowledge and experience is guided by wisdom as I. Kirzner taught us.

Finally, let us precisely communicate our exact observations: quantized fractal space-time characterizes our economic universe of fluctuations or wave-like motion as scale-free network. This global temporal compression is driven by cosmological special relativity (backward motion of time) and cosmological fluctuation (quantum wave frequencies); these natural laws are due to energy field (path) processes and biophysical system limits. Even the socially most ideal human economy has to submit to these universal laws of energetics as the technical application of energy resources drives human economic behavior and wealth ultimately; human societies are practically energy transduction systems. For almost 5000 years, the human

cultural civilization was developed by hydro and wind power; before this civilizing process wave, farmers were mainly employing animals and wood for energetic purposes in agrarian settlements (8000-3000BCE); the great leap forward occurred 50000BCE, evidenced by tool-making. Since 1750, coal became the lead energy, around 1900 oil was introduced and since 1950 nuclear power; today, we are researching into renewable and clean energy; some physicists and inventors are in search to technically convert quantum vacuum energy as a free future resource. Consequently, our back-casting can perceive and measure 5 chronic Kondratieff wave cycles of 5×50 periodical years or so; it is not sure that the so called 6th Kondratieff will continue in this wave frequency. Technological singularity (eco-energetics, biotech, health science, propelled by AI; the possibility of free vacuum energy; quantum monetary system) could bring us a fundamental turning point of human economic history and known wave frequencies. Accordingly, the mystery and chronic frequency of the 5 Kondratieff waves of about 250 years has altered the economic heartbeat of humanity forever; however, since 2001, it is not very likely that this chronic periodicity will continue. If we follow the prediction model of cosmological fluctuation, i.e. quantized space-time in fractal dimensionality, then we have to conclude that the temporal interval of the global economic wave frequency will accelerate singularly.

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