Saving Capitalism from Finance - condensed

Profit and Entropy Made Simple

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A conflict lurks at the heart of economic life. "Market efficiency" in an ideal economic system of fair competition leads to a wholesome balance of supply and demand, and minimal profit. At the same time, business success demands maximum profit. The economic system thus seems to foster conflict not just among businesses, but also between business and society, as society is an economy.

Financial traders make overt war against economics. They invent trading vehicles based on little or no value. They use lightening-fast, super-computation to find "market inefficiencies" and maximize profit. How could supply-and-demand forces possibly control such manipulations before they create crises? The Wall Street Journal of August 1, 2009 reports:[1]

> *Many high-frequency traders collect tiny gains, often measured in pennies, on short-term market gyrations. They hunt for temporary "inefficiencies" in the market and trade in ways that can make them money before the brief distortions go away*.

These profits benefit the speedy at the expense of the rest of us. This is the supercomputer equivalent of insider trading. The "thermoeconomic" model that we propose explains how exploiting market inefficiencies enhances bubble building-and-bursting events.

Many justify the pursuit of maximum profit, arguing that profit fuels economic expansion and new value production. Many erroneously believe that a corporation has a legal obligation to maximize profit, at almost any cost. One might think that using a fuel metaphor would imply knowing how fuel behaves, according to scientific thermodynamics. Anyone who does know will recognize that profit cannot possibly function as fuel.

Anything using fuel generates increasing entropy as a by-product. Any successful purchase-and-sale generates profit. Most people know about profit, but not many know about entropy. Before we may show how they are alike, we must briefly introduce thermodynamics and explain entropy. First, we discuss "cause and effect".

1. The sometime relevance of cause and effect. Most of us accept that a law of "cause and effect" rules the everyday world. Of course, anyone might want a vacation from reality, and enjoy animated cartoons or movie "special effects". Many people seriously misunderstand cause and effect, however. Some for example turn to astrology for guidance, even though the supposed positions of the stars and planets could not possibly exert any force to affect personal character or destiny.

In medicine, it is possible to prove what causes a disease. In social science, one cannot easily set up experiments that show cause. Instead, social scientists including economists must search crystal balls of data for statistical correlations that do not specifying what causes what. In economics, supply and demand "cause" each other to go up and down; neither is just a cause or just an effect.

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[1] *What's Behind High-Frequency Trading,* Scott Patterson & Geoffrey Rosgow, The Wall Street Journal, Aug. 1, 2009.

The astronomical planets long ago took their leave of "cause and effect". The planets are not magical; they simply do nothing new, so they need no fuel. Once in motion, they stay in motion. The planets have traveled around essentially unperturbed since they fell into their repeating orbits after the Big Bang. The force that attracts planets is not ruled by cause and effect, since the attraction between planets is a gravitational field, mutual and constant, depending on mass and distance.

In the late 17th Century, Isaac Newton accurately described the planets as though parts of a frictionless, forever repeating mechanism. If planetary time were not as perfectly repetitive as Newton said it was, no one could predict sunrises and eclipses. Nevertheless, this was rather a convenient model for Newton, because he knew little about fuel; no one had yet invented the steam engine.

2. "Cause and effect" causes increasing entropy. Life on earth is not so serene as motion among the planets; here, we can cause new things to happen. Newton's actions and reactions are zero-sum; they balance and cancel perfectly. In thermodynamics, the science of heat and power, a cause leads to an effect, which does not balance or neutralize its cause, but rather extends it.

To cause an effect, A exerts a force on B; or, A exerts a force, the result of which is B. One cannot force anything to occur without using energy. *The catch is that whatever energy flows from A to B cannot be perfectly recycled*. A car burns gasoline to travel. Some of the heat energy in gasoline propels the car, but much is necessarily wasted as heat, noise, and smoke. That wasted, useless heat is entropy.

We use energy that arrives from the sun, erupts from the earth, or hides in complex fuel molecules. Because energy is stored in molecular order or structure, regardless of what it accomplishes, using fuel overall transforms order into chaos. One simply cannot burn the Taj Mahal, and reclaim the released energy that built it.

Because almost anything that happens uses something as fuel, *entropy is the only quantity in nature that must always overall increase*. Because it must, increasing entropy points toward the future; increasing entropy is the very *arrow of time*.

Entropy is also a concept. A fresh deck of cards may be said to have a high order or minimal entropy; similarly, a well-shuffled deck of cards has maximal entropy.

Except for the study of frictionless motion, every physical science must account for energy expended to cause to happen whatever event it studies. Isaac Newton's assumptions alone justify the mathematics of the social sciences, however. For example, economists care about a "law of supply and demand" that obeys Newton's, "Every action has an equal and opposite reaction".

3. Thermodynamics. An introduction to thermodynamics is simple: heat causes molecules to move about in random agitation or excitement. The higher the temperature, the more molecules bump into and away from each other.

Heat flows from warmer to cooler, sometimes doing work. Having flowed, a hot-to-cold difference or gradient vanishes into a useless, lukewarm equilibrium. Once equilibrated, temperatures cannot spontaneously return to their previous, distinct state. "*Increasing entropy*" measures heat energy approaching useless equilibrium. In any system overall, entropy increases as anything happens until it reaches a maximum.

Here is a simple illustration of why entropy must always increase. Room A is hotter, at 60°; an adjacent, equivalent room B is cooler at 20°. That A is hotter than B means that air molecules in 'A' put more pressure on their confines than those in 'B'.

When a door opens between A and B, heat energy measured in joules moves from A to B - no joule of heat energy is lost in the transfer. The temperatures of the rooms equilibrate at 40°; no degrees of temperature disappear as they do so.

As temperatures equilibrate, room A cools and room B warms. Their distinction according to temperature *is lost* as both arrive at 40°. As room A cools, its molecules calm down. As room B warms, its molecules get busy. The math that calculates entropy reveals that the random activity in room A as it cools *decreases less* than the random activity in room B *increases as it warms*; overall therefore, randomness increases.

The Second Law of Thermodynamics is the 19th Century "law of laws" that governs cause and effect. It says that when possible, any warmer "A" will spontaneously equilibrate with any cooler "B". Therefore with time, heat spreads, entropy increases, the universe expands, and the energy available for work decreases irreversibly. The universe uses fuel recklessly, and some day will wind up (or wind down) cold and dead.

This is all one really needs to grasp about entropy to make sense of what follows.

4. Thermoeconomics. We compare a Buyer and a Seller of a horse to rooms A and B. In our monograph, *Saving Capitalism from Finance*, we explain how we ascribe an "economic temperature" to Buyer and Seller. A Buyer of a horse is like room A, "hot to trot" with cash. Buying the horse, dollars of price flow like joules of heat to the cooler Seller; the horse moves to the Buyer, cooling off the Buyer by a "horse's worth".

The selling price was $200. It only cost the Seller $150 to bring the horse to market; profit accrues. The profit margin makes the transaction non-Newtonian; this is no balanced, action-and-reaction. Since the only quantity in nature that must overall always go up is entropy, we surmise that profit corresponds to increasing entropy. In the monograph to which we referred, we present some mathematics that establishes the "isomorphism" of systems that produce increasing profit and increasing entropy.

A gasoline engine moves a car, and an economic engine works to drive an economy. Exploding gasoline returns an engine cylinder to receive its next fuel injection; the work of the action cycle transfers down the drive shaft to turn the wheels. The $150 that recovered costs for the Seller does similar thermoeconomic work; it restores the "system" to its condition before producing the horse, making it ready to produce the next horse. The 50$ profit resembles increasing entropy in the room A, B example, and the waste heat emitted by the car as well.

We cannot reconcile the association of profit and entropy with the notion of profit as fuel. Instead, we must make a 180-degree revolution in our thinking, and understand that profit is like a waste product. Profit signifies a healthy economy rather as a loaded diaper signifies a healthy baby. We must recognize that *we create value to recycle profit, and not the other way around*.

Corporations function well as recyclers of profits. One can even make a strong case for reducing corporate taxes, and instead having government share in profits as shareholders. Our target for regulation is profits leveraged financially to make more profits without recycling them into product value.

5. The problem of rules and regulations. The sudden and profound global decline of finance reveals the dangers of unregulated capitalism in the supercomputer age. We argue for regulations that keep an economy away from "tipping points" and "bubble-bursts".

Opponents of economic regulation with good reason complain that government rules have unintended effects; Newtonian economics in government policy causes them. As we mentioned, classical economics sets up a struggle between society and business. Newton's physics allowed people to believe in a natural law of balance and harmony. Government regulators in that spirit would expect to be able to exert control and predict the economic sunrise.

Newtonian economists in and out of government mistakenly seek to refine a gyroscope rather than to regulate an engine. Newtonian regulations that micromanage only inspire resistance, encouraging business people to "game the system". Newtonian regulation sets up a cops-and-robbers contest with business people of the sort familiar to parents who seek excessive control over their adolescents.

Thermoeconomic regulation can supplant the controls that react too slowly to be effective in our super-computing age of financial, instantaneous communication. Thermoeconomics will indicate and rules and regulations that are less susceptible to politics because they are scientifically defensible and coherent.

We must intelligently regulate the profitability of financial institutions, perhaps as utilities, so that they can keep capital liquid without overheating and vaporizing it. If financial institutions are "too big to be allowed to fail", then they are not free standing businesses, but utilities. If they cannot be well run privately, then they ought to be subdivided, nationalized, or internationalized.

<u>6. Inferences</u>. Many agree that economic regulation of finance is necessary at present. There is no consensus yet, as to whether these are emergency measures or signs of fundamental truth. The profit-entropy model makes clear that there is no reliable prosperity without coherent regulation. If the financial sector is sufficiently well regulated, capitalism may yet take care of itself, and of all of us.

We accept what contemporary economists already believe, that the market works best or most efficiently when it produces solid and reliable, rather than excessive and fluctuating profits. We can accept this vision as valid most easily when we recognize that profit is waste that we need to recycle into new value, rather than to maximize for its own sake. Recycling profit plows manure back into the earth. Harnessing energy, materials, and labor creates new value, and slows the progress of increasing entropy.

It remains to define how to measure recycled product-cost-value in terms of capital, labor, and environmental impact. Much of the world is used to value added taxation or VAT. We propose a 180-degree revolution. We would use a non-value added tax or NVAT to address the lack of recycling-of-profits value. Many financial products will score a high NVA and be commensurately taxable.

Whatever happens next, there is no need for socialist, central economic planning. Economic planning stifles innovation; proper regulation encourages it and rewards it. You cannot plan a baseball game, but you can umpire it. The more violent the sport, the more it needs regulation to succeed – like football, hockey, and boxing compared to bowling. Economics is a blood sport.

The original free marketeers were right: an efficient market makes minimal profit. Profit is evidence of business health, but maximum profit cannot be the goal, especially of finance. For capitalism to seek maximum profit means that capitalism is not yet toilet trained, and as a result may pollute the entire earth.