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[00:00:00] **Nate Hagens:** Good morning, 10,000 years ago, and probably 50,000 years ago in what's now known as Tanzania, our ancestors, price signals, gelles and tubers, and fruit, and other things. Today, it's the numbers that are listed on groceries and rent and gas and tuition, little barcodes everywhere asking us yes or no.

[00:00:29] Now, how often do we ask ourselves, why is that number there? What is that price? What forces shaped it? Milton Freeman famously said, inflation is always in everywhere, a monetary phenomenon. Yes, it's true. The amount of money creation with respect to the size of the economy is important. But prices in dollars or in euros or yen or rupees are signals from a living system.

[00:00:57] That has thresholds, pulses, delays, and feedbacks. Money acts as a current in an ocean of energy, materials, technology, leverage ecosystems and social contracts. Actually, ultimately money is a social contract, relying on trust and shared values, and one that will be increasingly stressed as a great Simplification approaches.

[00:01:25] There is a wider boundary framework of how all these economic factors interrelate, and I've come up with seven major drivers of either inflationary or deflationary impacts. On prices.

[00:01:51] Let's start with some definitions. Firstly, what is money? The textbooks say money accomplishes three things. First, a unit of account, second, a medium of exchange, and third, a store of value. All true, but Biophysically, there's also four a claim on energy and five a claim that externalizes the ecosystem cost and impacts like pollution, deforestation, soil depletion, species, extinctions, et cetera.

[00:02:23] Every dollar when it's spent. Effectively hires an invisible energy worker that leaves a footprint. This should immediately set you to thinking about how much money can there realistically be that is spendable in a functioning world, and other questions probably. Okay, so what impacts the prices of things in our world?

[00:02:49] Let's start with the obvious driver of inflation. Money creation. When commercial banks issue new loans, they create new deposit money. When central banks and treasuries coordinate stimulus, they inject new purchasing power into our system. If we look at the history of. Broad indicators of money supply like M1 and M two, they go through long periods of steady growth punctuated by jumps higher around almost predictably financial crises.

[00:03:23] That money supply growth has tracked more or less our expanding throughput of energy and materials over time. More money is chase more stuff, which enables more credit growth and then more stuff. But when credit expands faster than the real economy's capacity to deliver goods and services, people's purchasing power outstrips the amount of things that are actually available to buy.

[00:03:46] So prices rise to match this relatively increasing scarcity and sometimes often in crises. And sometimes not in crises, like now, it's the central banks that are pouring on this accelerant. Low interest rates and asset purchases, lift financial wealth, which then spill into real world demand with a time lag.

[00:04:11] You might consider interest rates as the price of money. Lower rates in effect, a lower price on money increases the demand for money and pushes prices for everything else Higher. Higher interest rates lower the demand for borrowing, shrinking money, supply growth, and decreasing demands for other goods and services pulling prices down.

[00:04:34] So the first category of things that impact. Prices. Money creation has an inflationary impact on prices. Indeed, the purchasing power of the United States dollar has declined by about 95% in the past century. That is the impact of inflation. The second category, as of those of you who've watched my online presentations, know we can print money, but we cannot print energy only extracted faster.

[00:05:07] The modern economy depends on concentrated oars, fertile soils, ample fresh water, and above all dense and affordable energy. As high grade resources are used up, we go after thinner, deeper, more scattered. Deposits like shale oil, that means more trucks, more rock moved and more energy burned per unit of output.

[00:05:32] back in the day in the 18 hundreds, we used to mine 40% copper ore in Butte, Montana than a hundred years ago. In 1920, it was 4%. for the entire country and now copper ore is down to 0.4% of the rock that it comes from. So we have to grind up 10 times more ore to get a kilogram of copper. That's happening to nickel.

[00:05:56] It's happening to oil. It's happening to soil, it's happening to all kinds of resources. And here's how it looks. Here's a graph showing copper production in the country of Chile. The blue bars represent copper ore production by the entire country, and the red shows how much energy was needed to get that ore.

[00:06:14] This dynamic is inflationary. When it costs more to obtain and process the raw resources, the prices of the end product inevitably goes up. And since energy is embedded in all goods and services, everything in society gets more expensive. If we can't reduce the energy consumption of industrial processes faster than energy prices grow, natural resource depletion writ large is also inflationary.

[00:06:44] So what about technology? Technology is usually deflationary over time when processes become repeatable. chips and screens and assembly lines, we reduce costs. From learning and new innovation, we squeeze out waste. We become more efficient, and we scale production and we standardize processes. Your television today costs a fraction of a TV 20 years ago and also does more things as a result.

[00:07:16] Demand for TVs also increased exponentially with nearly every household in the US having at least one in their homes. Not me. I gave my last TV to my brother, 26 years ago, and I've not had one since. Okay, but not all tech reduces prices. Some tech shifts costs into the physical world. a current example in the, news is AI inference and training demand.

[00:07:43] Large, always on data centers. These require electricity, land cooling. Chips and the supply chains behind those chips. If power grid strain or if adding capacity requires expensive gas peakers or long distance transmission or critical materials, AI's upstream footprint can cause prices to go up. electricity rates, server cost, even the steel and concrete for the data hauls.

[00:08:16] In turn, it's expected that the productivity from AI and the broader economy may increase overall between one and 2% a year, which if it happens, would be massive, but a mixed bag with respect to overall inflation. So technology tends to make replicable things cheaper. Until, and if it collides with resource limits or shifts cost to energy hungry infrastructure, but at least historically, technology has been deflationary.

[00:08:48] Fourth category. Prices are not just about costs. They're also about who can pay the costs. Affordability is the anchor of the demand for goods and services, and as I've pointed out recently on this show, there is a big difference between. Median income and wealth and the average income and wealth, especially in the USA.

[00:09:15] A lot of stories about the khap economy in the news, as in many places the median household is really struggling and feeling the pinch. So it stands to reason that when large groups run out of financial dry powder and then wages lag, interest payments rise and their savings shrink. And these folks cut back.

[00:09:40] Sellers find fewer buyers at yesterday's price. Then inventories, accumulate, and discounts appear. You consider price as a meeting point, and when the median buyer steps back, that meeting point moves down. Deflation, we saw this in various sectors. After COVID stimulus faded used, car prices dropped.

[00:10:02] Certain consumer goods were piling up, rents were being negotiated. Where vacancy rows. Affordability is why the market price is not a static thing. Price is just the agreement between buyers and sellers. This is why inequality is ultimately critical to the continuity of socioeconomic systems because of a third to a half of the population can't afford basic things.

[00:10:29] The financial system itself would collapse. Broad lack of affordability is deflationary. We haven't seen it for a long time, but it is on the horizon. Then there's finance. Greed status and human social creativity adds invisible springs and gears Between the real economy and the prices, we see leverage, which uses borrowed capital to invest and to hypothetically make more returns than the original loan.

[00:11:02] Magnifies the moves in asset prices slowly on the way up and often quickly on the way down. Then there's leverage on leverage, derivatives basis. Trades carry trades that even magnify further that magnification. So de-leveraging is deflationary for asset prices, first, stocks, bonds, houses, crypto, and can become deflationary for goods and services if the credit mechanism seizes up.

[00:11:33] So we've had loud, but so far not catastrophic reminders of this long-term capital management unwind. In 1998, these were the guys that, I used to work with at Salomon Brothers that forced massive margin calls in the global financial markets. That weren't about fundamentals, they were about our pension to create much higher financial claims on reality than reality supports.

[00:11:57] By the way, I didn't know them at Salomon Brothers. They were there at the same time. I was, John Merriweather and crew. But recently, in April, 2020, crude oil futures dropped to negative $35 a barrel and stayed negative for over a day, not because oil, the energy source became less valuable to us, but because storage was full, contracts were rolling and leveraged, financial players somehow had created claims on this physical resource that were way bigger than the physical resource itself, and they had to exit.

[00:12:33] Because of the financial contract. So today one of the world's biggest gears has been the Japan Carry Trade. International finance. People borrow in Japan where rates are low and they invest or speculate in places where rates or expect returns are higher and pocket the difference that works. Until it doesn't, because of the crazy leverage in the system, if rate differentials, compress, or if the Yen weekends, the unwind can force selling in places that beforehand seemed unrelated, including for existence, the US government bonds that the Bank of Japan owns.

[00:13:13] I think the last number is around 1 trillion. US dollars worth. So forced selling of previous leverage is deflationary for asset prices and sometimes for real goods downstream If credit tightens, this happened in the Great Depression in the 1930s. Leverage in our financial system has a big potential deflationary impact on prices.

[00:13:40] Next category is, an unusual one for a list of inflation and deflationary impacts. We don't often list ecology, on a list of things that influence prices in our

lives. But as viewers of this platform are aware, we are inexorably leaving. The ecological stability of the Holocene nature to the upcoming surprise of many is no longer going to be just an economic footnote.

[00:14:09] Droughts and low river levels affect barge traffic and power plant cooling. Not to mention hydropower and crop yields, from drought, heat waves pull gigawatts towards air conditioning requirements and they strain electrical grids, hurricanes in the energy basins. we didn't have many this year, but.

[00:14:33] there will be some that shut refineries or offshore production. calm, cloudy weeks in winter. What Germans call Duncan Flout, they cut wind and solar output just when the demand for electricity from those sources is high. Raising prices, more volatility in these conditions means paying for buffers, inventory, backup generation, redundancy insurance.

[00:14:59] All of these things further add costs, so buffers. Are inflationary and there's another longer term inflationary ecological layer, which is biodiversity loss and soil degradation are quietly raising input costs over time. Pollination pest control, water retention used to be completely free services from the ecosphere.

[00:15:24] And as services such as those fail, we tend to substitute them with more expensive energy and chemicals and the impact shows up. At the checkout counter declining ecological stability in the 21st century is going to be inflationary. Finally, the widest boundary of all the container that holds all prices.

[00:15:48] The currency system itself, currencies are human stories backed by power institutions, energy, resources, productivity. But especially trust over long arcs. Those stories change pegs, break claims. Exceed reality. political agreements dissolve. Historically, most currencies in the world have lasted around 30 years in, in unchanged form.

[00:16:19] When a currency loses credibility, historically, the move can be very fast. Wimar, Germany's, Zimbabwe, Argentina are some countries that come to mind. Different paths, same arc. People suddenly shift on mass. From prioritizing money in their lives to prioritizing things themselves that money could buy, and this is called hyperinflation.

[00:16:44] When in the purchasing power of money drops so fast, it becomes close to worthless. It looks like prices exploding, but it's probably better stated as money imploding. Often. after a rapid plummet of the existing system, there is a reset, a currency reform, new rules, new units, new living standards. As the economic system re stabilizes and finds a new normal, such a reset can be sharply deflationary.

[00:17:16] We are now over 80 years past Bretton Woods running a fiat system with deep dollar plumbing throughout the world. And we're 50 years past the end of the gold standard, which marked the end of any built-in tethers to physical foundations of our currencies. That system has delivered flexibility and growth also on the backs of a growing carbon pulse.

[00:17:41] it leaned heavily on the assumptions about energy availability, about affordability, geopolitics, and domestic cohesion. If any of those pillars wobble. Currency trust becomes something that we took for granted. I don't know the timing or the form of any future reform. I do know that in response to our accelerating crises, governments like Japan, but many others will increasingly look to borrow and spend their way out of tough economic situations and eventually instead of a too big to fail situation that we faced in 2009.

[00:18:20] With Lehman Brothers and Bear Stearns, we will have a too big to save situation. No group of central banks would be big enough to bail out France to give one example, and then it's the hedge fund known as the global human

economy that will have a margin call currency. Architecture is a driver of prices in a way most citizens never think about until it's the only thing we think about.

[00:18:48] If and when it happens, it's hyperinflationary, then the aftermath becomes deflationary. So this entire list of things I just went through that influence prices. Is also a story of complexity. Sustained economic growth has dramatically increased societal and financial complexity. And when a system grows, we know from Metcalf's Law we increase the nodes in a network of people or companies or supply chains, but the number of connections between the nodes increases as the square of the nodes divided by two roughly.

[00:19:27] So with 10 nodes in a system, there are 45 connections. But at 50 nodes in a system, there are now 1,225 connections. These exponential connections in a global society require energy to maintain, and this is now built, webs upon webs of dependencies and interdependencies. So I suppose I could have listed complexity as an eighth force that could dramatically influence prices.

[00:19:56] I bring that up because what follows this complexification of the last century is a Simplification and given the amount of leverage claims built, infrastructure and energy blindness amidst our current cultural stories of singularities and planetary exploration as inevitable. it will eventually be a great Simplification complexity, doesn't do well in reverse, which is kind of a core implication and warning, from this podcast channel.

[00:20:34] So why am I doing it, frankly, on prices and why do these things matter now? Yeah, because I increasingly see all these forces are starting to stack and influence each other. Governments and central banks have taken over a large chunk of the money creation process. By deficit spending, nation states are now going into debt in a big way.

[00:20:54] In an unsustainable way. bond and currency markets are starting to pay attention to these things. There's an active move in Asia and also the bricks countries to move away from the US dollar, which underpins the whole global financial system. Also in Asia, Japan's interest rates basically zero for the last few decades are spiking and the currency is selling off.

[00:21:19] And with, from a biophysical vantage, Japan has no real natural resource endowments, by the way, and has to import most of its energy and then pay for it with a suffering currency, and print more money to do it. On an effort. another realm, AI is accelerating demand for energy and water infrastructure, and at the same time replacing humans with robots and software.

[00:21:45] Those same humans, need money to buy groceries and pay their auto and mortgage payments. and there are constraints in supply chains of critical things in the world. I just learned that if you order a new natural gas combined cycle turbine by General Electric, it can't be delivered for like six or seven years or even longer.

[00:22:06] unless we forget, oil depletion is accelerating. And to be clear, peak oil was never about running out of oil, but the oil that's available in the open market that's owned and sold by exporting countries won't be able to keep pace with the growth requirements of the world's financial system. We are now in a perilous period where we're increasing our financial claims on reality, while reality deteriorates.

[00:22:35] AI is of course a huge wild card. It might boost productivity, which likely won't be evenly distributed, but it also might crash the system before it lifts off because of all the extreme demands on energy, water, and other infrastructure. How all these things interrelate in the coming decade is impossible to fully predict, but barring some new boost in productivity, the bounty of which

would be shared widely in society, we are in a financial, social musical chairs moment.

[00:23:11] What money is, what it's underpinned and supported by what it can be spent on, how it holds its perceived value. These are all open questions, and I think walking the tightrope of inflation and deflation as a central banker or ahead of government was relatively straightforward on the up slope of the carbon pulse.

[00:23:31] Now this tightrope has become the social contract itself, and unless productivity rises. And its gains are shared. We're playing musical chairs with increasingly fewer chairs and more people wanting seats. Lastly, as listeners know, I care the most about the natural world. that is earth's ecosystems and her ability to support other generations of ours and other species way into the future.

[00:24:02] But between today's situation and our species living more sustainably and ecologically and balance is the mother of all deflationary pulses. I'm calling it The Great Simplification, which is what we've been unpacking for the last four years, on this show. And it's that deflationary pulse on the horizon, is why I'm skeptical of environmental and cultural solutions that assume or require current societal complexity and throughput at 19 terawatts and growing because those plans are not gonna make it through, in my opinion.

[00:24:39] They're gonna be lots of financial stories and headlines in coming years. The reality is money is a cultural belief and our current price tags. Our messages from the metabolism of our civilization, but civilizations change, they go through phase shifts. One of the core inferences of this advance warning is the need for advance policy, understanding scenarios, and building research constituency and brake glass in case of emergency interventions that result in bending, not breaking.

[00:25:14] Catch the tightrope walker. In a net five stories down, instead of falling 25 stories to his death, it's important to recall. That at the moment of a great Simplification, a deflationary pulse of a, drop of five stories caught by a net, the same amount of factories, oil, infrastructure, and expertise will exist as before the fall.

[00:25:40] They just no longer make sense where our affordable. This is a story I'm gonna dive deeper into next year. that's enough for today. Thanks for listening.