

[Transcript] FYI - For Your Innovation / Back to Basics: Debunking Some of Bitcoin's Biggest Misconceptions

Welcome to FYI, the four-year innovation podcast.

This show offers an intellectual discussion on technologically-enabled disruption, because investing in innovation starts with understanding it.

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All right, welcome to the Bitcoin brainstorm.

Alongside my co-host, Yassine Almondra, analyst at Arc Invest, I'm your host, Rod Rudy, co-founder of Bitcoin Park, a community-supported campus focused on grassroots Bitcoin adoption and a home for Bitcoiners to work, learn, collaborate, and build.

We are now on episode number three, and if this is your first time tuning in, let me explain what we're doing here.

Thanks again to the support from Kathy, Yassine, and the Arc team.

We are taking our monthly Bitcoin topic-based approach at Bitcoin Park and applying it to this new monthly podcast series we are calling Bitcoin Brainstorm.

Each month, we plan to have a different topic and invite amazing people from a variety of areas within the Bitcoin community.

Our aim is simply to drive conversation around Bitcoin, and after going deep into Bitcoin with the first two episodes, building and scaling, and AI and Bitcoin, respectively, we're going back to the basics this month.

So we have approximately 60 minutes, and we'll be covering a lot.

So let me do some quick introductions for everyone, and then jump right in.

This month, we have Alex Gladstein, Chief Strategy Officer at the Human Rights Foundation.

We hosted the inaugural Global Bitcoin Summit with HRF at Bitcoin Park last month, and it was truly an honor hosting 100-plus developers, activists, organizers, and entrepreneurs from six continents representing 55-plus countries.

Also, Jameson Lopp, co-founder and CTO at CASA, and creator of some of the best Bitcoin resources, including [Bitcoin.page](https://bitcoin.page), [Lightning.how](https://lightning.how), and [Statoshii.info](https://statoshii.info).

And also, Kurok Ray, as I like to call him, the Bitcoin professor at Texas A&M, who is now teaching two Bitcoin classes this semester at Texas A&M, one in engineering and a new one in the business school.

And also, Eric Hurstman, who has built a number of companies in Africa, and is now the co-founder and CEO of Gridless Compute, a distributed, rural, hydro-Bitcoin mining company in Africa that supports local energy development.

So Cathy Wood, founder, CEO, and CIO at Ark Invest, and Kathy's mentor, Dr. R. Laffer,

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a district-led Americanist, and also a fellow local Nashvillian.

So with that said, Yasin, my friend, where should we start?

Oh, man.

Well, first of all, we'll just start with some of the smiles that I see on these screens, because we just had a pre-conversation with the podcast, and I could sense that there's just going to be a lot to talk about here.

I'll quickly set this up, and then ultimately take it away.

This podcast is for you, Dr. Laffer, just by the way, I must say, and I think the audience might need a little bit of context here.

We had a really incredible conversation, I think, between Cathy, Dr. Laffer, and Ophelia Snyder.

That was the second conversation that we had about Bitcoin.

Really exploring some of the economic merits of Bitcoin, and I think what really resonated with the audience was, Dr. Laffer, you're really understanding an ability to provide a little bit of context as to what makes Bitcoin so special without necessarily explaining it in the context of Bitcoin, and I think the ability to have the economic background that you have and explain the merits of Bitcoin without necessarily understanding the technical merits adds a lot of credibility to the case for Bitcoin, and the case for private money in general.

I think that this conversation, when we explore, call it falling down the Bitcoin rabbit hole, the hardest thing that I've found to convince people of is the economic merits and less so the technical merits.

It seems like right now we have that in reverse, where the economic case for Bitcoin, the ability to create an alternative money outside of central banking, is pretty much something that everyone in this conversation can agree with, and now the conversation can extend to, why Bitcoin from a technical perspective?

Dr. Laffer, we've had conversations behind the scenes on you just wanting to understand Bitcoin from cryptography lens, from the lens of how it works as a technology, as a software, and so we wanted to use this conversation as really like an evergreen content piece by which you can really open up about some of the questions that you have about how Bitcoin works and have a lot of our esteemed guests answer that to the best of their ability, also understanding that our esteemed guests have a really strong understanding of the economic merits of Bitcoin, and I think very rarely are you able to strike that balance, so I'm really, really excited about this conversation.

Maybe Kathy, if you want to explain a little bit of context as to how we came up with this conversation, your relationship with Dr. Laffer, your conversation with Dr. Laffer, and why this is a really cool, call it round three of the conversation about Bitcoin with Dr.

Laffer.

Well, Art and I go back a long way.

I met Art at the University of Southern California.

He was trying to set up there a supply side school of economics, a little bit Austrian in its emphasis, and I was there and fell into his, into the rabbit hole that he created, and he gave me my big break and introduced me to this business, Capital Group on the West Coast,

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and Art started a consulting business not long after that, and I've subscribed to that, and I talk to Art all the time.

In 2015, I called Art, and I said, we are writing a paper on Bitcoin.

Can Bitcoin serve the three roles of money, and would you collaborate with us?

And he said, well, let me read it first, and he read it, and there was one very economic-centric part, and there was one very technology-centric part, and he said, I will sign on to that first part. I don't understand the rest of it, and we'll get into some of that here.

But what his conclusion after reading the economic part of the paper was, you know, I've been waiting for this since we closed the gold window, a rules-based monetary system, a global rules-based monetary system. Now, I'm not sure I agree with the rule, meaning it's a quantity rule, but they'll figure that out over time.

And so I said to him, I said, okay, Art, that's a very big idea. How big could this be?

And at that time, 2015, Bitcoin was \$6 billion in network value or market cap, as you might call it.

And he said, well, how big is the U.S. monetary base? And at that time, it was \$4.5 trillion.

Today, it's \$8 trillion. And I said, oh my gosh, this is a very big idea. And then ARK plowed right into it. Certainly, I did personally, and ARK, as we did all of our due diligence, plowed into it through the only way we could, which was GBTC, the only security available at the time.

And so we've been having this conversation. And during the regional bank crisis this year, I felt that was a very important moment for Bitcoin. And ARK, and I did a conversation about what was going on with the regional bank crisis. And it was very interesting for both of us to observe that while regional bank stocks were imploding, some banks were going bankrupt, Bitcoin appreciated from \$19,000 to \$30,000, flight to safety. This idea of truly transparent, decentralized, no counterparty risk resonated with those who really understand Bitcoin. And so I think that's when we really came back together and said, okay, we have to do more with this, because I have not seen ARK. So ARK is 83, he just told me. And I have never seen ARK. ARK, you have been so rejuvenated by this discussion of the potential of private money taking us back, taking us back to the future before 1913. So I will leave it there. And Rod, Yasin, and ARK, you take it from here. Well, should we jump into the question that Dr. Laffer asked us right before, that we had one of the best podcasts before.

What are all the criticisms of Bitcoin? Well, I want to hear from you.

What are all the criticisms? That's great. I'd love to hear that. And what are they?

And Alex had a great answer. Alex, you have a list of them, Alex.

Yeah. I constantly get engaged by the mainstream media on this. And there's quite a few, but they boiled down to that it's a waste of energy, that it's good for criminals, that it's too volatile, that deflationary money, which Bitcoin sort of one day will be, is bad for society, and that it's too slow for retail transactions. I think those are the kind of top five that I personally see. And by the way, I just heard Jamie Dimon of JP Morgan today echo all of those. Let me, I'm writing them down when you do it, Alex. Can you just tell me you said energy, and I'm assuming that's the mining, what it takes to mine?

That the proof of work consensus is a waste of energy, that we should, you know, we should figure out a different currency that doesn't waste energy, that it's good for criminals because you don't need ID to use it. So anybody can use it. So authoritarians get very concerned about that, that it's too volatile. Obviously, it's fixed supply is something that makes it

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very volatile during its adoption phase. So people get worried about that. And that deflationary money is bad for society. Currently, Bitcoin has inflation, but it's scheduled to end at some point. So people get worried about that. And then finally, that it's too slow. So Bitcoin, at its kind of most fundamental layer, only updates every 10 minutes or so. And a lot of people don't realize that there's been a lot of technological innovation to ameliorate that, but that's kind of what they take with and they run with that. A lot of the criticism is either Keynesian economic theory, or it's various technical or security issues. And in most of them, I think can be addressed by the fact that Bitcoin is a distributed system run by many independent operators. And if there is some sort of catastrophic issue, humans can always come together to figure out how to address it. I've got it pretty well, what you said. Is there one of those, Dr. Laffer, that you wanted to get interested in? Well, the volatile one, I'd love to handle. I'd love to handle the deflation one. What we talked about in the last podcast was what was money like prior to the bank in 1913, the Federal Reserve Bank. That's when they put in the income tax and the Federal Reserve Bank. Prior to that, U.S. money was private completely. Banknotes were all issued by banks, et cetera, banknotes. The federal government had two functions, basically one critical. It defined what a dollar was. A dollar was one-twentieth of an ounce of gold or one ounce of silver. And it also minted coins. You could take your gold in and they would be minted or silver. You could, but there were lots of other minters in the country. The government was just one of many in a competitive marketplace. So that's what it was prior to 1913. They started taking control over money, trying to. In 1932, they took control over it very extremely. There was something called the Bank Holiday Act. And that prohibited private ownership of gold in the United States. So everyone had to turn it into the central government, which they did in March of 1933. And then they devalued the dollar by 75% in the next six months. And then that was all confiscated in Fort Knox. And since then, then you got the Smithsonian Accord, which was in '71, which really eliminated all gold and all currency backing entirely. And that's sort of where we are today. The inflation rate from 1933, early 1933 to today, is prices have risen 23-fold. And the prior two centuries, it was zero, effectively zero, you know, some bubble to but net, there was no inflation. Now, I don't understand why people think it's going to be deflationary, but they can have their own wish. But what we need to do with a currency or a coin, like Bitcoin or like gold or like anything else, is a quantity rule will not work. You know, you could have a quantity, but when you have shifts in demand, you're going to find the price changing. And that will be the volatility. So what happens with gold, which is also basically quantity restrained in the world prior to 1913, for sure. What you had is institutions set up to guarantee the value of the unit convertible, make it convertible. So we had a price rule, not a quantity rule, inside a quantity system. And the Bank of England did that function very well for centuries. And what you had there is basically they monitor the buying and selling of gold and pounds on a daily basis, three times a day, the Bank of England, morning, noon and night, to guarantee the value of the British pound. And there were moments there of cessation of convertibility, for example, a war would start in France, and there'd be a huge disruption in the market. So they just pull out and not do intervention there to stabilize it.

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And then when things settle down, they come back in and stabilize it. So those are the things that can develop very easily with a Bitcoin system, I think. I mean, they sure did with the gold system, and why not with a Bitcoin system? But it would take other institutions to make a price rule rather than to convert a quantity rule into a price rule. Can we stop there? This is so important, because when we were doing the podcast with Ophelia, you were talking about how, yes, quantity rule right now, but once you get the market into equilibrium, whether it's institutions coming in finally, corporate treasuries, sovereign funds, once you get through that, what you talked about that I thought was so interesting, that is, if you have a system where you have funds like ours, ETF funds, and futures-oriented funds, you would end up, and I'd love to get the reaction from everyone here, you would end up evolving it, if it is what we think it is, into a price rule situation.

I mean, you can make a price rule situation. Also, it fits in with the deflation, because deflation depends, I don't know if you think of it in terms of Milton Friedman or stuff, and I don't, but let's just say you did, because there's a limited number of Bitcoins that, therefore, as GDP grows in the world over time and all that, that then you would find less and less Bitcoin per unit of GDP, and then you'd start finding deflation, a curve to get the real value of Bitcoin up to being the same ratio as GDP, that's sort of the monetary view of the world.

If you look at that, there's no reason why that's true, because you can surely have, you can surely have a system that uses Bitcoin as sort of a monetary base the way gold was, and then you had the banks, which then use the leverage on the gold system, so banks would issue liabilities that were larger than their reserves based upon the cash inflows and outflows on that, so you can have clearly a monetary base and a monetary expansion and allow Bitcoin assets total to expand quite along with GDP or whatever else the demand for money is. Now, you probably have substitutes in the system as well, I don't know if you do will, will or not, but we have all sorts of substitutes and money in the system. I wrote a piece in the JPEE called Trade Credit and the Money Market, you can use trade credit to arbitrage the transactions demand for money by using trade credit there and matching income and expenditure streams on credit,

so they're just lots of ways, so I don't see a serious complaint about Bitcoin with regard to deflation, and if you get a price rule system in there, if something like a banking system comes in and decides to do that, I don't see why you'd have a problem on volatility either. I mean, all of these are there with regard to anonymity. I think anonymity is a wonderful trait, not a bad trait. Yes, it can be used by criminals, that's for damn sure, but it cannot be used by governments, and I sent you that book, Kathy, on coding. If you know prime number coding, you can make literally codes today that are unbreakable, and you can transfer them to an owner and a thing, and you can guarantee, and Kathy, you may want, you have that book there, I don't know if you did, I didn't bring my copy today, I should have, but if you read the thing, and I think it's called code, and if not, I'll get the name to you there, but you can have systems today that are literally unbreakable, and that you can have guaranteed anonymity using the prime number systems in the code, where just the user, just the one party and the other party have the code, and you can do that, and no one can break that code. I mean, they literally can't.

So, all of that stuff seems to me to be very easily done. The energy one, I don't really understand, but I understand it takes a lot of energy to mine Bitcoin, and I don't understand why

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that's the case, and why you would want that to be the case. That does seem to me to be waste, it's like mining gold, and gold mining makes no sense whatsoever, if you're just going to put it in the vault. Mine, you might as well make it, you know, something you hate, and put it in the vault, so it takes it out of the circulation in the world, but the mining one, I don't have an answer to, because it is expensive, and there shouldn't be, the mining cost should not be there. It just doesn't make sense. Adding a zero to a dollar bill is not expensive. Am I right, right or wrong? I'm going to have Jameson start and answer that question, because you're not wrong in the sense that if you don't dig into the proof-of-work mechanisms and see how Bitcoin mining is affecting a number of areas, and repurposing energy, and revitalizing towns in a number of different ways, that energy use is exceptional in my opinion. It's kind of like saying like this data center that supports the internet is a waste of energy, or this dishwasher dryer is a waste of energy, because it just washes, but we're supporting the monetary network of 8 billion people, and I think that's, in my opinion, the best use of energy. But I'll pass it to Jameson who can answer it, and then Eric, I'd love to hear your thoughts on that as well.

Yeah, yeah. Mining is a fascinating industry, and there's a lot of interesting economic results and incentives that are occurring due to the fact that mining incentivizes people to seek out the cheapest forms of energy that are out there, and that's often renewable and stranded energy, and I won't go into that because Eric is the expert there. I will speak about the security mechanism. Why is mining so expensive? There's no reason why mining has to be expensive. We could make a proof of work system where the difficulty of generating a block only takes a couple of CPU cycles on a laptop, and that is in fact how Bitcoin operated for several years as the network was being bootstrapped by miners. But the reason why that doesn't actually work, if you're running a global network that is full of adversarial actors, what ends up happening is that everybody starts proposing their own blocks, and so think of it as Bitcoin has tens of thousands of independent node operators running their machines around the world validating the transactions and blocks coming in. Somebody has to create the next block to move the history of the system forward, and if you don't put some sort of cost function on that creation of adding history to the blockchain, then everybody is just going to go crazy. There will be thousands or millions of blocks flying around all over the network. It's essentially a denial of service attack. So this proof of work mechanism, it was actually originally invented as a denial of service prevention and was originally proposed by Adam Back as denial of service prevention for email sending and receiving. But what we have now is we have a system that has become so valuable. It pays for its own security. We sometimes call this thermodynamic security, but the point is the system is paying for its own security for making it difficult for people to add another block. The flip side of that is it's insanely simple for anyone to validate, receive that data, and then propagate it around. But it really is, it's a sanity check and it prevents the system from being overwhelmed by bad actors in this one particular use case. Yeah, so maybe I can give some more color on the energy used too. Bitcoin does use a lot of energy. Mining takes a vast quantity of energy to do all the compute cycles that are necessary to secure the network. I think what's interesting about it though is maybe best encapsulated by what Troy Cross says, which is that Bitcoin keeps energy from being wasted. It doesn't just use energy, it pays for energy. The way that works in our world is that when we look at the kind of energy poverty parts of the world,

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energy isn't going there because there's not a good return on investment.

The national power grid is only goes so far. And when we look at the mini-grids that are populating across places like Africa, where the largest portion of people don't have energy, they have a problem that they're not financially viable on their own. They don't have an anchor tenant just like you wouldn't build them all without a Macy's or something like that. And so they need somebody like us who could be geographically agnostic. We can be in the mountains

of Malawi or on the Zambezi River in Zambia. And we can make that energy work for the first time ever and be financially viable. And that has, of course, big opportunities for the people in that area, but it also helps to decentralize this Bitcoin network that we're all a part of.

I can also offer a little bit of a caller from Texas here where we have 17% of global hash rate is happens in Texas. Some of the biggest mines in North America are right in Texas about an hour from where I live. The one thing that we have been studying here at Texas A&M, we have a blockchain

and energy research consortium, is the ability for Bitcoin miners to stabilize the energy grid. And this is a little counterintuitive because people always talk about the level of Bitcoin mining, the level of energy use, but for the purpose of the grid, what really matters is the volatility. And the reason the miners can benefit and help the grid is that they're a large load and they are flexible. And so they have huge amounts of power that they can stop and turn on and off on a dime. And that actually has a huge benefit for the grid because it allows the grid operator, ERCOT, to be able to smooth out the energy uses across the state. And so during the summer,

when there's a huge demand for energy because of the hot summer months, Bitcoin miners can turn off and that smooths out the energy consumption over the whole state. And the challenge is just the ERCOT has to coordinate among the miners, but we're building out incentive programs to make that happen. Yeah, but Karak, let me if I can, you stabilize it by balancing to the highest cost by taking energy and using it when it's cheap and making it not cheap. And when it isn't, when it's expensive, you don't use it and you stabilize, but it is a net resource use to get Bitcoin. And that resource use could be used for air conditioning or something.

The argument here is Bitcoin, I don't think, needs the energy used to be valuable. I think it's valuable in its scarcity and its use purposes. And a dollar bill doesn't have any use whatsoever, but it sure as hell is valuable. For sure, you want to compare benefits and costs, right? I mean, the problem is when most people talk about the energy use, they're only looking at the cost side of Bitcoin and they're not evaluating the benefit at all. And if you want to do- What is the benefit? What is the benefit? Oh, the benefit is that you have secure immutable money. I mean, sound money for the first time in a generation. But why can't we just have Bitcoin? I mean, I don't know the computer program that Satoshi built. I've heard about it, but I have no idea what the program is, but it's asymptotically approaching units or something. Why don't just go to the 21 billion units and be done with it? And just have no cost to produce and just get that done. Don't use the energy up. And now we've got a quantity of Bitcoin that's fixed and let's go from there like gold. You don't need mining operations in gold to make gold valuable. Yeah, well, maybe it would just help to underline how valuable Bitcoin is. I think a lot of the energy talk misses the fact that it's profoundly valuable for tens or even hundreds of millions

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of people in the world right now and that in the future, it'll be even more valuable. Most critics look at the energy cost and they don't understand that Bitcoin is really valuable. They think it's literally just a waste of energy. So once you realize that the overwhelming majority of the world's population lives under very weak currency regimes and under political oppression, where they

experience very high inflation, capital controls, oftentimes they get demonetized, their savings gets evaporated very quickly, their bank account gets frozen, they can't interact or transact with colleagues, friends, family abroad. Once you realize that for most people on earth, money is like this huge problem and that Bitcoin is a very helpful tool for a lot of them that could even save a lot of lives. It has saved a lot of lives. Then I think that conversation changes a little bit. And once you acknowledge it's valuable, then you start to realize the energy use is worth it to secure the system. I mean, I'm sure, James, yeah, go ahead.

It might be helpful to just take a step back, Alex, explaining why you can't just print 21 million Bitcoin. Well, there's basically, sure, I mean, and I'm sure Jameson has more to add, but basically people tried to create eCash for decades. And one of the biggest problems was that you had a centralized issuer. You had a centralized mint. So really one of the big revelations of Bitcoin was the idea of creating a decentralized mint. So the issuance process is no longer in the hands of a handful of people or a corporation. You had really, really good private money created in the 1990s by David Chom and his colleagues. It was extraordinary privacy, but it was centralized. And so the government could take it down. And then after 9-11 happened, the AML rules, anti-money laundering rules for any of this technology became extremely basically overwhelming. So it kind of prevented innovation in this area. So people like said, let's try to create an online digital money that has a decentralized mint. So basically the way you do that is you create a global competition that anyone can enter by contributing some electricity.

And now the issuance process is no longer centralized. The other way to approach digital money is by having a group of people determine the issuance. And then that's more like fiat money in terms of they're kind of always tweaking how much there should be. If you want to look at an alternative, it would be something like Ethereum, where the monetary policy is kind of always changing

because people are trying to figure out what the best way of doing it is. And that's a centralized sort of scientific process where they're always tweaking the interest rate essentially. They're always tweaking the tax essentially. So this is an alternative way of doing it where there's no human tweaking, where it's like set in stone and it's one rule for everybody. And the only other way to do that is to have a system called proof of stake, which again is like kind of like dollars or Ethereum, where the people who have the most of it, they control it. So this is a very different system where the people who have the most Bitcoin don't control the system. I categorize it in two different ways, right? There's many different proofs, proof of stake, proof of space time, proof of authority, whatever. But you can generally categorize these in one of two ways.

As I said earlier, the point is to create a cost of creating a block and moving the system forward and also creating a cost against people rewriting the history of the blockchain. So the question is, is that cost going to be internal or external to the system itself? And basically every system other than proof of work uses an internal cost. It does something with the tokens that have already

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been issued by that system to basically say, I'm going to steal your tokens if you look like you broke the rule and you were acting naughty. Whereas with proof of work, we have this external cost, which it turns out, I think, is pretty nicely incentivized and distributed in the sense that energy itself is distributed all around the world. And my thesis is that over the long term, we are going to see this particular aspect of Bitcoin become more and more decentralized, whereas a lot of these other networks that are essentially working off of the rich get richer systems are going to become more centralized from that aspect. The question comes to me is, will the marginal cost and energy determine the value of a unit of Bitcoin? And I don't want that to be the case. That has been argued since the very beginning of Bitcoin. The argument is, I mean, there will always be a monetary premium based on the interest. No, I don't mean a premium. Yes, let me, yeah, there'll be a premium, but it's like the mining cost of gold. If you've got gold, let's say, what is it, 1860 today or something like that. If you've got that cost, your minds can operate and produce gold when it's announced, if the marginal cost is 1860. And that will be the cost. Now, maybe there are premium, there are 100 bucks or something. That's not what I'm after, is if you have it, the energy cost, you will be really affecting the value of a unit of Bitcoin by the marginal cost of production, by the cost of the electricity, depending where in the world you're operating. So I don't think so. I mean, the marginal cost of energy will affect the mining and the proof of work, and ultimately, the security of the blockchain. And that's not a binary decision. It's security is a sliding scale. But the value of Bitcoin will be determined in the market for Bitcoin, the supply and demand for Bitcoin. And so the demand of Bitcoin is going to be the most important thing for determining that. And also cost of mining. I mean, if there is any mining going on, that marginal cost will be the value of a unit of Bitcoin. I mean, it might impute loosely to the value of Bitcoin, but I mean, I still think it's pretty indirect how that marginal cost of energy is going to directly filter down to the actual value of Bitcoin, because the miners are just securing the network. The users are the ones that are determining the value in the marketplace. Well, don't the miners just get can determine how much Bitcoin they can produce by the amount of electricity by the amount of energy they use? No, no, they get their block subsidy from the protocol. So the protocol determines their compensation. Correct. Yeah, you want to explain the Coinbase reward and then the transaction fees and maybe break it down? Yeah, for sure. I think the difficulty adjustment is the important thing to touch on here. Just to build off what Alex and James were saying. So the miners are essentially playing a lottery and they're constantly playing this lottery to essentially guess random numbers. And the reason is that the system, which I will call the protocol, needs a way to select which block is going to be the next block in the blockchain. And so this permissionless lottery allows anyone in the world to mine Bitcoin and to essentially guess these random numbers. There's a target that they have to hit or be below. Once they are below that target, then the first one to win the lottery gets their block placed onto the blockchain. And your probability of winning is based upon the amount of energy you use? Yes, essentially. Yeah, the more energy you use. It is a marginal cost, even though it's probabilistic marginal cost. It's the expected marginal cost. It's a marginal cost versus the expected value. And what they're doing that is trying to optimize that group, at least the way I understand it.

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Yeah, so okay. So the miners face this marginal cost and that will affect their ability to play the lottery. And the reward is fixed. The reward is determined by the protocol. Yeah. I got that. I got the reward fixed. But you can change your probability of winning the lottery by using more energy. By using more energy, yeah. And that will determine the marginal cost. That's all I'm saying is that there will be a marginal cost for the expected value. Yeah, there will be a marginal cost. Yeah, that cost is factored into the miners' production function, so to speak. And that will affect the value of a unit of Bitcoin.

For the miner, correct.

Or vice versa. It will ameliorate the rise in the price or it will cause the rise in the price.

But can I just point that brings your attention? Like right now, it's the all-time high roughly of how much electricity is being expended into the Bitcoin network. And yet the price is no or close to its all-time high. So I think it's important to distinguish these things.

They're not going to necessarily be connected. So they're not even necessarily correlated.

Well, they are connected. They just aren't unit connected. They aren't just connected in a straight simple rule. You have variations in the demand curve. You have the supply curve sitting there, and you have both of them operating simultaneously. But what you said about what it does for tyranny regimes and all that is so, so true. And it is global. And that's so, so true.

And that's where I love Bitcoin is because it's global, because it's not controlled by a monetary authority in one country. And it can be circumvented totally. And it can be made anonymous. I love that anonymity. So your fear is that if energy gets too expensive that the network will freeze up?

Or what is your fear around this this piece? I don't know. I mean, I don't know why it would be there. Why you would want to have that. If you can just have a fixed quantity and have people get it elsewhere, you know, it just seems to be a cost. It's like charging, you know, it's like you have to mine a hundred dollar bill. Dr. Laffer, I think the best way to think about Bitcoin is actually very similar to gold in its sort of natural resource characteristics. Think of Bitcoin like a digital natural resource where you can actually pose the exact same hypothetical.

Why don't I just print a fixed amount of gold and just leave it at that?

Wait, if you could, wouldn't you do it if you could? Yeah, but the reason why gold is valuable is because it's costly to produce. If you can't, there's a scarcity element to it that along with its fungibility and its atomic property. Now, let me ask you, Yasin, do you think gold would be valuable today if it weren't costly to produce? You couldn't cost it. There's just a fixed quantity. No, I don't think it would be. If there's a fixed quantity of gold, you don't think the value would be high? Yeah, but you're asking for the cake and eating it too. Well, that's what I'm asking for here, because Bitcoin is a constructed thing, not a natural thing given by some sort of protons and neutrons and whatever.

That's a good point. I think that the beauty or the miracle of Bitcoin was one where it's like, how do we actually create artificial constraints to replicate the costliness to produce in the same way that we would in a natural resource? I don't think that you can trade off.

There's basically the idea of Bitcoin's computational inefficiency is precisely what gives it its security and assurance guarantees. That's simply a trade-off that no one has been able to resolve. I'll drop the topic here. I have a little check mark just that I'm not quite there yet. Dr. Laffer, let me add one more piece. It's a little bit forward thinking, but I think it's actually pretty profound in terms of the way it could impact the world. Let's say this thing does

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succeed and a lot of people start using Bitcoin around the world. Today, the whole global economy is controlled by the US government and its allies. We can costlessly print the US dollar more or less. Malawi cannot. Their local currency is not accepted on world markets. If they want to buy fertilizer or oil or whatever, they have to earn dollars. There's only a handful of ways they can do that. It really constrains their ability to develop their nation. If you go fast forward to the future and who knows how probable it is, but let's just say for our discussion today that Bitcoin becomes really a widespread, powerful currency in the world market, that allows the people

in that country or that government to permissionlessly turn their electricity into the global reserve currency without having to do a deal with one particular power or country. It could have major, major implications for global economics if it goes out. Let me ask you, Alex, and then I'll drop out because I don't want to. The marginal cost of creating a Bitcoin is going to escalate dramatically over time until that 21 million. Did I get it right this time? The 21 million number is reached, but as you get closer and closer to that, the costs on the margin will be higher and higher and higher. That Malawi, as you said, won't be able to afford it even with all of it. No, but as Eric can attest, it's not. For example, a lot of people have free electricity. If you have a river, you're not paying for your electricity. There's a lot of energy sources in the world, and what you could think about Bitcoin as is that it's a hunter. It hunts relentlessly for the cheapest possible energy in the world. We're going to innovate ways to unlock amazingly cheap energy all over our planet that we haven't really thought of yet. I think if Eric could be worth you, just building off that. We should probably drop on this part. When you say costless energy, I don't believe you for a second. It's surely not costless. If it were, it would be everywhere, and no one oil would be a tenth of a penny a gallon. Maybe just to finish it off, and maybe we didn't start in the right place with energy, but maybe Eric, you can finish this off and then we can get into some of the other variables that really do excite you about this movement.

Yeah, I won't spend too much time on this. There's a lot of nuance around mining, around everything from the energy and where it's found to the difficulty adjustment. That's a really important part of understanding the costs of Bitcoin mining. What I would say, though, is that even in places very far from where people would think would be the cheapest energy like in Ethiopia, you're already seeing a retail price of energy under two cents, and that's pretty remarkable, right? Now, will we ever go to zero? There's always a cost to, there's a capex cost, there's an apex cost to running things, and so there's always going to be a cost for something, but I think what we're going to find is that that cost is worth it to secure and make more Bitcoin. That's something that I think not just people in the U.S. or Europe can appreciate, but people in emerging markets that maybe need it even worse. What I was hoping that Bitcoin would do was the marginal cost would be the stabilizing element.

See, what you really need to do is people care about prices, not quantities, and what you need for a transactions medium is you need to know what the value of that transactions medium is today, tomorrow, next week, so we can all make contracts in that medium, long-term and short-term, and be assured that both the lenders and the borrowers know what the value will be five, 10, 15, 20 years out, so there we need a price rule rather than a quantity rule, because you'll always get stochastic access to man functions that will lead to volatility in pricing and any product where you use the product, but if you've got a price rule, you can do all those stuff in

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circumvent, all these, well, how did you tick tutorial totalitarian governments? You can get around them all, especially the U.S. one, when Janet Yellen wants to get rid of \$100 bills, you know why she does, and the only reason is so she has control of your life, not you.

I mean, we all understand that, but we need a price rule in there, but a price rule can easily come from an entity or a group of entities stabilizing the value of a unit of Bitcoin. That can come in the marketplace. I mean, all you need to do is have a definition of it, and then people then do the price rule within the quantity rule, which is really what I love, because it has to be a price rule. I don't know how you would enforce that. I mean, this is a highly decentralized system. But markets will do that. That's what you've got.

Dr. Laffer's proposition is basically you're suggesting a Bitcoin standard in the same way that we had a Gold standard. Of course. That's exactly what I'm saying.

Yeah. And I think that's quite a compelling proposition if you think about it. Basically, why the Gold standard failed, I think Bitcoin solves for, and I think you can really have synergies with, call it managing the economy. I'm not going to let you get away with why the Gold standard failed. It didn't fail. The governments were convened in 1913, then they did it in 1933.

They destroyed the Gold standard by not allowing private holdings of Gold, etc.

The Gold standard didn't fail. The government overtook a private sector.

You're spot on. And I think part of that were the logistical limitations of Gold.

And it was much easier to call it, make the case to centralize Gold reserves because it was clunky, and you shouldn't have it under your bed. And there's just this slow boiling frog syndrome.

If you think 250 years is a weakness in the commodity standard, I'll differ with you there a day of the week and twice on Sundays. I'd take a 30-year period of stabilized Bitcoin value.

You know, you're always going to get these people trying to control your lives. That's the end of that story. That's their nature. That's the beast in humans. And I think Bitcoin circumvents that beautifully. Now, a lot of other things circumvented it as well, but nothing like Bitcoin. Now, the reason I love Bitcoin so much is because it was costless to produce. And it's obviously not costless. And that's a problem I have with Bitcoin then. But baseball cards, when we were kids, we'd trade goods and serve as baseball cards, tokens for bathrooms in New York. They used that. All sorts of money substitutes have existed to try to get around the government. And this is a classic case of a big one on a global scale with anonymity being successful. And if it's not successful for 100 years, maybe only 90 years, I'd take that every day of the week.

So one of the things I love about, you know, debating with art is he has no preconceived notions. He's a monetary scholar. His mentor or one of his mentors, I think I can say, was Robert Mundell.

Am I right on that? Yep. Yep. Monetary scholar, Nobel Prize. And so when I'm debating with art, I'm just getting it as he sees it from a theoretical point of view. And I

grounded in a theory that I have trusted over my career. Now, one of the things we talked about art, and I felt like we were getting somewhere, this is a quantity rule right now. That's just what it is. 21 million. 21 million. And what I sensed in one of our podcasts was, okay, 21 million. And how do we, and forgive me, all of you here who assume that 21 million is it and there's no price rule, it's only a quantity rule. But you seem to suggest that this quantity rule, if successful in the way that you're hoping it is, and we're hoping it is, and believe it will be, that there would be, as futures markets evolved and structured products evolved around it, that it would evolve into some kind of equilibrium. Banks. Just plain banks. Banks hold gold reserves. They

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issue gold certificates, and they can change the amount of liabilities they have. We have risk associated with the currencies, but they took the gold as a monetary base, and then they did issued liabilities, and they issued more liabilities. And it's a multiplier banking system that would come out of Bitcoin. I would see. I don't see any reason why that couldn't exist. You can still have the 21 million. You can still respect the 21 million. And have many more liabilities. I think, yeah, the idea with like a, call it a Bitcoin standard, is that you would basically just have a unit of currency pegged to a specific amount of Bitcoin. Yes. And then that would, everyone would agree upon that peg, and then you can basically have more predictability and easier sort of balance. But see, I wouldn't even make it a currency. I would have the Bitcoin being the piece itself. You don't want to have it tied to a currency. What you want to do is have the Bitcoin locked to some composite goods in 25 different countries, Malawi being one. And you do have that, and you can have done a price rule where you have monetary organizations, private issuing liabilities in the currency. There's no reason why a bank can issue Bitcoin. No. Are there any thoughts on that proposition from the panel? Well, I'm curious, Dr. Laffer, can you explain a little bit more why we need this price rule? Why is the quantity rule not sufficient? And also, stable in value over time so we can have contracts around Bitcoin, like we do with dollars. And the dollars is where the government gets the thing there. If you can have contracts 5, 10, 15, 20 years out, markets develop where we can realize the stability of value and Bitcoin will replace all currencies in minutes. I mean, in minutes it will replace them because you know that the dollar is the most unstable, uncontrolled thing in the world except for all the other currencies by other, as you call them, totalitarian despotic states. I guess my reaction, Dr. Laffer, would just be that Bitcoin is going to take a long time to get to that level of stability and it's not going to be the best money for, I think, quite some time for most people. If you have a choice between a dollar and Bitcoin, you're not going to denominate your contracts in Bitcoin most likely unless you have some hardcore evangelical belief about its value in the future. That being said, the reason why I care about it is obviously a lot of people around the world don't have dollar access. But also, I think that there's just again this gradual, gradual process. There's no possible way it could stabilize when, so you think it's going to be sudden? Well, you don't need too many large institutions adopting it to have that gradualness. Well, gradually then suddenly, right? It will never, it will never dirk in Zambia, out in the bush, in Zambia with five people in a village. It's probably not going to be a Bitcoin village. It's probably going to be trading a cow for a sheep. But for the massive amounts of the global commodity, I see Bitcoin as a replacement of the dollar. I see a replacement of the euro of the yuan. I see it replacing the yen in the bulk of international transactions, just the way the dollar did in the 19th and early 20th century and the way the pound was earlier. This is what I really am very excited about, because only now the pound is not controlled by the Bank of England. It's controlled by the value of a pound created else. Euro dollars, perfect example. In the 70s, euro dollars were all over. We had institutions in Europe issuing dollar liabilities and accepting dollar loans developed there without any relation to the U.S., without any relation to the Fed controlling that quantity. That's what I'm really excited about, Bitcoin, is getting rid of domestic critical. So you think there's going to be, you think there's going to be like, for lack of a better term, euro bitcoins, right? You think there's going to be a lot of pay for Bitcoin? Yes, U.S.

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All over, yen bitcoins. I agree. Every country will be using them and every major business will be transacting them. And you may have some specific laws in the U.S. for example, you have to pay your taxes and dollars, but that monopoly will disappear very quickly and the senior age gains from dollars will disappear overnight. That's what I'm really excited about, because it literally takes away the monopoly on money from the Fed and the Treasury. So I have moments like this. I know it's been a little messy getting here, but I have moments like this of clarity, because I know Art knows what he's talking about. And when he says this can happen much more quickly

than we think, I believe him. I believe him. He's a student of monetary history and like, and he does, as you can tell from the energy conversation, he's going to drill, drill, drill until he understands this. So the fact that he's saying this could happen so much faster than anyone now believes is really interesting to me, right?

Absolutely. I think the two main topics that we kind of touched on, which is like too volatile and waste of energy, I think are pretty solid in terms of like a basics, getting back to basics.

And Dr. Laffer, I think we continue to dig in. I mean, because the waste of energy is literally almost undoubtedly the topic that is brought up at most in our conversations now. I don't know why, but it is. And it's like, how does 21 million, why 21 million, how is that 21 million possible and doesn't waste too much energy? So I appreciate you digging into that.

Yeah. I would love to see you guys who think this is good on the energy thing, to write up a paper on it and express your views very critically in written form, so that people can look at the words themselves and criticize and ask questions back and forth to sort of asymptotically come to a good explanation of why energy really is good as a use. Getting the value of Bitcoins locked in, I love it. I love the idea it would replace the dollar and these other currencies and get stable prices for a long period of time. There's no reason why the Treasury and the Fed should control money. Money should not be a public entity. It just shouldn't. Now, the other topics is I love the anonymity because, damn it, I don't want them tracking me because you know why they want to track me and I know why they want to track me. And the two are very different reasons. I don't want them to track me. It's not because I'm a criminal. Maybe we can touch on that private key cryptography identification. Well, I've got the book that I gave it to Kathy. You guys, if you haven't seen the book yet. Yeah. No, just to give you some nuance and I'm sure others on this call will go deeper or could if you want. But I would probably describe Bitcoin more as a permissionless system and that's what gives it its power. Like anybody can use it. It can be tracked, especially if you're not careful. The beauty of it is that you don't need to link your real world ID with your Bitcoin activity. As soon as you do so, you can absolutely be tracked and you will get caught. So that's the beauty of it is you can use it with cash without a government ID to buy and sell. The thing is, if you do attach your ID to your Bitcoin, it can be tracked. I just wanted to kind of clarify that. I don't think that's necessarily true with the encryption devices that we have available to us. I think we can get around that if you want to get around it. No, it's true. And I would recommend you call it pseudonymous, but anyway, maybe Jameson has more than that. All right, pseudonymous.

Well, to be clear, Bitcoin is not encrypted. It uses cryptographic functions, but unlike some alternative networks that have actual strong privacy, Bitcoin does not actually encrypt information to make it difficult for people to read. In fact, it's quite the opposite where

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everything that happens on the Bitcoin main chain goes to everybody in the world who is running a node. Now, you can build alternative technologies on top of Bitcoin that are more private, and that has been happening. But it's like dollar bills. It's like checking accounts, like all of those you can. But that to me is one of the really attractive things of Bitcoin. Do you want to explain what ties ownership of Bitcoin in the network, that it's really just the possession of a private key and how that's generated?

Bitcoin is a system of rules and of math, really. And so what you're doing whenever you want to spend Bitcoin that you have, you have to provide proof of that via a cryptographic signature, and that has to match a public key that the rest of the world knows. By signing with your private key, which only you know, you can provide this proof to the world that you own that particular entry in the ledger, and you should be able to manipulate it as long as you're following all of the other rules of the protocol. And this is how basically every one of these networks is operating. They just tend to change a bunch of the other rules around the transaction formats and volume and so on and so forth.

Now, is this written up with Jameson?

Well, there are many books and many websites that have been written to describe the protocol. It's very difficult to concisely talk about all of the different mechanisms. But suffice to say, there are hundreds, if not thousands of individual rules that are part of the protocol. And whenever you're running a node, you're essentially, you're automating the auditing of all of those rules.

I think one of the things that we haven't dug into too much is kind of what makes the Bitcoin network and actually the use of Bitcoin so valuable and so resilient against the very thing that you don't like, Dr. Laffer, which is governments being able to control it, is that decentralization. And you know, I'm not sure I'm the best person to talk about that. Somebody like Korak who kind of teaches us every day might be a better person for it. But it's a very important part of Bitcoin and probably should be discussed to understand the security and the value of it.

Yeah, one thing Dr. Laffer that might help is you can think, this is a little simplistic, but you can think that there really are two kinds of security in Bitcoin. The security within a transaction and the security across transactions. Within transaction, that's what Jameson was talking about. It's the cryptography, the hard science, the digital signatures that unlock the your ability to spend the Bitcoin. Those Bitcoin all live in the blockchain. What you have is your private key, which is the ability to spend that Bitcoin. And that's a private key, right? Yeah, that's a private key. And the only person who can get that private key is the person that you're spending it to. No, no, you have that private key. And when you want to spend your Bitcoin, you essentially create something called a signature. And that signature unlocks the Bitcoin that is connected to the public key that the private key generated. Okay. It's kind of, if you're ever interested, there's a lot of cool pictures. These are elliptic curves that are in defined over finite fields over big, big prime numbers. And the private key is kind of how many times you... Well, that's the book I was talking to Kathy about was called Code, I think it is. And it goes through all the methods of developing these codes that are absolutely unbreakable. That's right. It's absolutely unbreakable. The biggest risk of this is you just losing your own private key. That's the real risk. That's the true of everything when you're 83.

Right. Yeah. So that's what happened when people in early Bitcoin days, they lost their private key. They didn't lose their Bitcoin. They just lost the access to that Bitcoin because they lost

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their private key. Well, that just shrunk the whole quantity of Bitcoin, did it not?

That's right. Teach you to lose your key.

Yeah. And the other thing we already talked about, the security across transactions is the blockchain. That's the security that the miners are doing to constantly make sure that we have one true chain that everyone agrees on, on all transactions. Yeah.

The question I would ask then, is there any way of making Bitcoin such that the governments can't trace back all the transactions to each unit? Well, then it would not be auditable and we would lose the best property of it, which is the fact that we know exactly how much Bitcoin there is at any one given time and we can prevent debasement of currency. So what people do instead is they build applications on top of Bitcoin to allow you to transact with someone else more privately.

And there's all kinds of ways to do that. And those are proliferating.

And that's the concept I was talking about a bank. Right, Alex? That you can have another person issue a liability in Bitcoin, which can be private, even though the Bitcoins on the monetary base there are part of the reserve. That's what I was talking about.

Exactly. So there's a cool concept that goes back to the creation of Bitcoin, Bitcoin banks. And these are like, they could be federations, but basically the idea is you deposit your Bitcoin and you get a fully anonymous token.

That's exactly what I'm talking about. That's the part I love.

Bend that and then anybody can then redeem that at the Bitcoin bank for real Bitcoin.

So yeah, there's all kinds of ways to do that.

Yeah, and that shouldn't be very difficult to do.

It has been though, because it's technically hard to do, but I will tell you that in the next few years, it'll get way, way easier. With quantum computers, it'll be really easy.

Yeah, I mean, it's a Chami and E-cash variant that's been around since the 90s and just applying that technology to Bitcoin. But at the end of the day, you still have custodians.

And I think a lot of this whole conversation has been very interesting to me because I feel like a lot of what we've been talking about is what I think is actually one of the bigger weaknesses of Bitcoin. And that basically has to do with what you might call paper Bitcoin or IOUs or essentially custodians running as fractional reserves.

And while those of us who understand the protocol are quite sure of the game theory and the inability for anyone to change that 21 million number, the rest of the world outside of the protocol is far more manipulable. Well, now, let me ask you about the 21 million question.

How well do you know the program that can cause the 21 million? I mean, it's five lines of code, which I myself have personally audited and many other people have audited as well. So it is, in fact, probably one of the simplest mechanisms for distributing newly issued money that I've come across. And that is it. So you're comfortable with that?

We don't have to trust Jamison, by the way. I'll actually come to your office. I'll walk to your office, we'll set up a node, and you can just run the Bitcoin blockchain yourself and verify yourself. Yeah, but anyone can change that, right? And in fact, back in 2012, at the first Bitcoin halving, a bunch of miners got together and said, hey, we don't want for our revenue to get cut in half. So we're actually going to change the code that we're running so that it doesn't cut the block subsidy from 50 Bitcoins a block to 25 per block. And what happens? Everybody else ignored them. Their blockchain that they forked off on was completely worthless because nobody

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wanted to trade those tokens. And they were forced back into consensus with the rest of the world. So this is kind of the magic of a lot of the game theory that's going on with the network.

Hey, Jamison, how did they ignore them? Well, it's automated, right? So basically, those miners, they kept chugging along and they started creating blocks that were still giving themselves 50 Bitcoin. But the thousands of nodes around the network, when they received that block,

they checked it against the rule and it said, hey, at this block height, you should only be getting 25. So what happens? They basically throw that data away. They cut off their network connection with those people. And they say, you know what, you're a bad actor, I'm not talking to you anymore. And that is fundamentally how the governance of Bitcoin works. It is this bottom up emergent property amongst tens of thousands of independent operators who they're just, they're receiving data, they're checking it, and then they're deciding whether or not to accept it and whether or not to relay it to their other peers on the network. So that's a really good example about having the Coinbase reward going from 50 to 25 to 12 and a half. And right now, we're at 6.25. So on average, every four years, the Coinbase reward is cut in half.

And then we're talking about a waste of energy. They actually, these miners that colluded and said, hey, let's collude together and it'll be 50 Bitcoin per mine block. They lost a lot of money. They lost a lot of energy resources and so on. And the folks that were just node operators that were just one of the participants. So there's miners, investors, node operators and such. They just said, we're going to continue to adopt and support the rules of the protocol and carry it on their way. Is that a fair explanation, Jameson? Yeah, the nodes really are the beauty of the decentralization

of Bitcoin. That's where all the beauty is. Can I flip the topic to volatility back again?

What do you people think makes Bitcoin valuable? I think the ability to transfer and store value in a permissionless and guaranteed way without... What do you mean by guaranteed, Yasin? Tell me how much you define these words as you go. What do you mean by guaranteed, guaranteed value? Guaranteed settlement. So if I were to, let's say, send one Bitcoin from my wallet to another, I am effectively guaranteeing a transfer of ownership in a way that doesn't rely on, call it a centralized counterparty to approve or deny that ownership.

What about volatility and value? That's the one then. I understand that and you really need to have the transfer assuredness clearly. Yeah, I think the volatility in many ways highlights Bitcoin's, the credibility of Bitcoin's monetary policy. I don't know if you're familiar with, I'm sure you are, but that macroeconomic policy trilemma, the impossible trinity, where you have basically three edges. You have fixed exchange rate, free capital movement, and an independent monetary policy. So for instance, a classic gold standard is one that chooses a fixed exchange rate and free capital movement, but foregoes an independent monetary policy. Well, you have to because a gold standard guarantees that there is no independent monetary policy. Exactly. So the idea of this impossible trinity is that you can only satisfy two out of the three objectives and that's what I love, that the third will contradict one of the first two. And so all Bitcoin does is it chooses an independent monetary policy and free capital movement and foregoes a fixed exchange rate. And so because it's chosen two of the three, volatility is really just an emergent property. And one that isn't necessarily, that we haven't necessarily seen in the past,

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like a Bretton Woods is an independent monetary policy and a fixed exchange rate, but there's no free capital movement. So I would say that, I mean, there are two points here. I think the first is in the early stages, volatility is really just this natural consequence of Bitcoin's monetary policy. It doesn't prioritize exchange rate stability, and that's why you can have a free flow of capital and it limits that growth of money supply, where you can have an independent monetary policy. So by definition, you have to forego a stable exchange rate. And that's where I think to Korak's point, the Bitcoin's price and its value is really just the function of demand relative to supply. Let me pull you back a little bit, Yasin, a gold standard. Let's just go right back to the gold standard system there. If you have a gold standard with many countries, you've got that guaranteed monetary system that can't, the Fed independent authorities can't do anything about their money. They cannot. You've automatically got fixed exchange rates, an ounce of gold equals an ounce of gold, whether it's in Britain or in the U.S. It's there. Yeah, I agree. I think but now the question is about gold, is what is its volatility with respect to goods and services for people doing transactions? That's what really interests me, is the demand for money really is one of time horizons. Can we make contracts in a unit that has a guaranteed value going forward? Now gold tended to work pretty well. The price level was defined in terms of gold. Who defined that price level? The Fed or the U.S. government. The, you know, an ounce of gold was a 20, a one 20th of an ounce of gold was a dollar. And the gold was then banded. Now the price of gold was fixed. That's why you had complete deflation during the depression because that depression was the rise in the price of gold, the real value of gold. But the volatility is what you want is a numerator that stays common value over time. It doesn't have volatility. So people will want to hold it for transactions purposes and negotiate contracts into the future for that. And that's what you really want in value. We had gold clauses in all of our contracts in the U.S. until 1933. And then they were all outlawed. I mean, that's really, that's really interesting. I think I'd love your thoughts on you. You would still need though that third party like the Fed or the government to define that. I don't think so. You and I could do that across. You're in Casablanca and I'm here in Nashville. We can have a gold clause. We don't need to do it. I guess in an ideal scenario, if you can get like global consensus. But that's what Bitcoin is. That's what Bitcoin is. It is a global consensus. It's a money that's not a dollar. It's money that's not a ruble. It's money that's not a peso. I mean, it depends on your reference point. But gold's obviously been highly volatile against the dollar. It's gone up by 6x in the last 20 years. I would argue it's the other way around, but that's okay. I would agree with you, but that's from gold's reference point, right? From the dollar's reference point. Yeah, it's collapsed completely against gold. Dollar reference point that costs the goods and services. The CPI has gone up 23 fold since 1932. Who the hell wants to live in a system like that? Hey, I think we all agree. Well, then what I'd like to see with Bitcoin is I'd like to see the purchasing power of a unit of Bitcoin like the dollar, like gold prior to 1913. You had about 100 years, two and a half centuries of literally stable prices. So, Art, I have a question. We're talking about quantity rule versus price rule. But when we discussed this at another moment in time, you thought that this quantity rule,

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Bitcoin based on the quantity rule, would evolve to be able to serve, to stabilize.

Yes, I do think that. And I think that's what happened to gold, Cathy. As gold was there, there were a lot of other quantity monies. If you know the word fee is cattle, and then you have salary, salt was used. All these different units were used as money over historical times.

And what you do is you have that, you have the value determined, become stabilized by private sector, buying and selling the commodity to guarantee its value and lending and borrowing it.

Gold in isolation as a standalone, let's say, commodity is a quantity rule. Is that?

Yes, that's why. And so is Bitcoin in the same sense. But within gold, financial institutions arose to guarantee the value of gold. And they did. They arose right in the center of a quantity of fixed gold in the world, let's say. All right. And then the banks came in and they monitored in such a way that they guaranteed the value. What they would do is they'd

buy and sell their units of currency or whatever the values would be in terms of pressure. That's what the Bank of England did. It's a really interesting conversation because I guess to Jameson's point, you over rely on counterparties and then you just get the abandonment of gold entirely and then it just doesn't work. And so I think there's this interesting trade off where it's like, let's say the more you call it build on top of Bitcoin and build infrastructure, let's say to facilitate a price rule, the greater you are at risk to the greater counterparty risk that you have where you no longer have as much control or you no longer preserving sort of the free properties that Bitcoin operates on standalone. That's correct. That's totally correct.

That what you have happening is all of a sudden you've got the supply of Bitcoin infinitely elastic with respect to the price rule within the range we're talking about.

Basically does not have counterparty risk, but it has exchange rate risk and it's the only digital asset to have no counterparty risk. And that's why I think we're so interested in it. I agree.

I would just, I think Dr. Laffer, one thing that would be a good action item is there's this book that came out recently that I think does such a good job of describing the evolution of money and of Bitcoin and to your point, and I've written a lot about how the US government defeated gold in

many ways. But at the same time, science also helped defeat gold in terms of when the telecommunications

came out, it became easier to exchange fiat balances over the Atlantic. There was some science and there was some politics, right? So this book, Broken Money by Lynn Alden is so awesome, and it really, I think, cuts to the heart of a lot of your questions. I would totally recommend it. I think the thing here is you really want to do is have it a universal money that no government controls. I think we can all agree with that. And I think we also want to have it anonymous, and maybe not the Bitcoin itself, but because of your blockchain stuff, but surely substitute liabilities can be perfectly encrypted.

Well, Dr. Laffer, tomorrow night here at Bitcoin Park, we're actually hosting, I think, 20 or 25 Vanderbilt students, and the topic is what is Bitcoin? So we're going to go from the nodes to mining to the economic incentives to deep down the rabbit hole of why 21 million and such. So if you want to walk down or take a two-minute drive. I would love to. I can't. I'm going down to Florida tomorrow for a day, but I'll be back. But Rod, will you make sure you come over to the office shortly? Give a call here. You must. It's a museum, Rod. It's a museum of history. It's unbelievable.

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100%, and I'm going to bring some presents as well. And we're going to bring some books. We're going to bring some books. We're going to bring some boxes. We may even run a note at your office, Dr. Laffer. Well, if you really want to do it, we'll last a little late and maybe have a little bourbon. I'll bring my friend Hank's OH Ingram over, and we'll have some nice bourbon. That's for sure. That sounds great. I'm very excited by all of this, by the way, and I'm very excited by you guys and what you're doing. And how fast now, Alex, how fast are they advancing on the transaction speed? Very. I mean, now you can use Bitcoin in a way where it settles instantly anywhere on earth. Like I've sent value from my living room to the Middle East in three, four seconds. So that is being solved for sure. Great, because that's really important. I think of V2, if we will. And sorry, to be clear, it's an asset. Like that's an exchange. It's like a bare instrument moving at the speed of light. Beforehand, all we had were liabilities. Everything else is a digital liability. This is a digital asset, and I think it can move. Like that is huge. That's the new paradigm, Dr. Laffer, whereas you couldn't really have the bare instrument in gold retain its properties because it was physical in nature. You can with Bitcoin. You don't need... No, that's what I understand. And the neat thing about Bitcoin,

I thought, but now I'm having hesitation on, is that it doesn't descend the net resource loss to the planet. But now with your energy requirements, all of a sudden it's becoming that resource loss. I will send you all the resources on Bitcoin, the case for Bitcoin and energy. And I think Jameson actually brought up a really... Well, I'm really excited about reading about those. Yes, please do. We're going to link to them in the show notes as well. So all of the stuff that we're talking about, we're going to do our best to link to them so the audience can also follow along to the conversation and the resources that we're talking about. I'll just finish by saying he... Jameson brought up a very subtle point on the cost to mine Bitcoin. In the early days, it actually ends in very costless. Like you can spend, call it \$10 to mine 50 Bitcoin. But I think the beauty and the incentives that Bitcoin provides is it's a marketplace and it's a free market of competing nodes. And the very fact that we have as much energy expended is really just a function of the demand to mine Bitcoin and people realizing how important and valuable of an asset it actually is. But if no one was mining Bitcoin, it would be completely free to mine. So there is a strong signal as to the interest in Bitcoin is directly correlated to its energy expenditure. And that's a complete conversation. Just remember the thing here. If in fact, financial intermediaries do evolve and if they do evolve, they do. And if they have disciplined, that's strong. I've always wanted to make the dollar as good as gold because if you made the dollar as good as gold, no one would want to hold gold. And the value of gold would fall sharply if you knew that the dollar were as good as gold. And all I'm saying here is if you get good financial remediation, don't think that Bitcoin necessarily its value is going to keep rising. Just it's not the motto of Bitcoin is don't trust verify. So that's don't trust but verify. That's a guy I worked with very closely said that too, by the way. And if they are interested, they will have no edge over anyone. They'll just be a market participant like everyone else. If they want to mine Bitcoin, they can join the crew. But there are no special preferential treatment like you might get in a centralized system. But there are no restrictions on mining gold either. There isn't, no. And look at what we saw. We saw at least investment banks getting full stack. There are huge restrictions. If your country doesn't have any gold, you can't mine gold,

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but every country has electricity. If your country doesn't have any energy, you can't mine gold, Bitcoin. Okay. All countries have some access to some kind of energy, Alex. No, it does depend upon energy and what it costs and all that. Lots of things in the supply function. All I'm saying is if you can make a dollar as good as gold, there's no reason for gold and the gold price falls. When we did that under Reagan with Volcker, we got the price of gold down hugely. Just dropped like a stone and all the gold hoarders got hammered. They called me a gold bug back then. Mandela and I were both gold bugs and that stuff. But by making the dollar as good as gold, which is what we should do, but the government is unwilling to not take the senior age gains they can take by printing money. They just can't resist taking. Now, we did it in Argentina with the currency block down there in Argentina. We got the Argentine peso to be as good as the dollar. Bang. And we did that with 100% convertible, 100% reserves. I mean, so there are ways. All I'm saying is that right now it's a store of value. But if you were able to do a good financial and a intermediary system, no one would need to hold the Bitcoin per se if they had an instrument that was as good as that. You follow me on that? Please do 100%. The Argentinian reserve currency, that was Steve Hankey did that one. And we did a bunch of other ones there. But all we try to do is just make the local currency and you never can when you've got Yellen in there. And these other people, God knows. So this was my professor. And I had him on such a pedestal when I was his student. And over these, how many years, art? 40 years? 12 or 13. And during crises, during 0809, I'm consulting with art only in a crisis usually. And art asks a question. It's like, oh, yeah, the Treasury bill rate did drop below the Fed funds rate. He said red alert, we're in trouble. And they're just like, he doesn't follow the markets the way we do. He just knows his economics and knows the warning signals. And the most important thing to me is he says he loves Bitcoin. And I believe him. He is absolutely true to his monetary theory and his monetary stripes are so strong. It's a perfect substitute for currencies. I mean, it's just the perfect one. And I don't think it'll take long. It doesn't take long to bend over to pick a \$50 bill up. And if that there's real market transaction value to this, and companies could use it, the dollar's gone. And the reason why Russia and China are trying to get a new currency in there to do the transactions in is because of the weakness of the dollar. And the reason Bitcoin is strong is because the dollar is weak. And the dollar is mismanaged and unhandled. I know the Fed people very, very well personally, and they are not trained in this. Powell talks to economists to get his answer as opposed to telling them what the answer is, like Bulkard did or Greenspan or McChesney-Martin. So when you've got that type of problem, it's a perfect time in this world to have a new currency come into play, I think. And the most important thing that I learned from this is this could happen very quickly. It can happen really quickly in very large quantities. I mean, you don't need to have many large companies start transacting in Bitcoins to have it really supplant all sorts of numerators. I mean, really, you don't. So I think we should just compound that with some closing thoughts, because we've just gone an hour and a half, and this has been fantastic. And I want to be cognizant of everyone's time. And definitely we need to do this again, Dr. Laffer, because this was fantastic. The questions you're asking and the way you're inquisitive and such, I've really, really appreciated. Shall we go around the horn with some closing thoughts? I can kick it off real quick, because Dr. Laffer, when I do come over, I do want to...

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I'm not going to debate you. I just want to learn from you.

It's not debate. I just want to know.

No, no, meaning around the five properties that make up a medium exchange or a store of value, because we've been talking a lot about gold. But I would say on the verifiability, there's portability, acceptability, portability, verifiability, acceptability, and divisibility.

And then the most important we're talking about is scarcity, with gold being perceived scarcity, with Bitcoin. It's got every one of those. It's got assayability. It's got divisibility.

It's got all those characteristics as well. To a lesser extent, much lesser extent than Bitcoin.

Bitcoin can divide it down below a molecule. Gold can't.

And keep going. Verifiability. I don't know how much...

Verifiability is very easy with Bitcoin. It's not with gold. You can find a thing.

If you have a chunk there, you have to do a core sample to be able to test it.

And that's why core samples and silver and all that, because you can have a medium there, and you can have an inside being different combination, so that what you might call it could say Eureka, and it's gold, and it's not. Portability, one billion dollars worth of gold versus one billion dollars. Oh, God. You figure out how many pounds can you carry.

And of course, you know, 12 ounces is a pound. So you try to figure that out.

Let's imagine it's 2,000. So it's what, \$24,000 a pound.

10 pounds is 240,000. And 10 pounds is 240,000. And then 100 pounds, whatever it is.

And I'm bringing Jameson and Eric with me to move that, because I'm going to need a lot of ammo and

a lot of people. And when you run across borders because they're chasing you, it's hard to carry that much gold. I mean, and especially if you have to carry it where they can't see it, if you know what I mean. On the divisibility side, you come to the park, we'll buy a very cheap cup of coffee. Gold, unfortunately, is not accepted, but you will buy a cheap cup of coffee on me. Bitcoin, will you pay for it in Bitcoin?

Yes, sir. It's Bitcoin Park. We only accept one. Oh, okay. Well, how much is a cup of coffee, just for the record in Bitcoin? It's about 4,000 sats. So 100 million sats or Satoshis equals one Bitcoin. And that's where I think, as a V2 conversation, because of V1, we were talking a lot about layer one. And I think we were conflating layer one and layer two, layer two being from stable coins to other cryptos to other mediums exchange in the local currencies, which Alex, Jameson, and Kurok as well as Eric can speak deeply on. I think with Bitcoin, it's actually just that at least at the end of the day, the settlement layer. And we kept on talking about volatility. My aspirations in life, I'm a little over 40 years old. I have four kids under the age of five, and I have a lot of future expenses, private school, house. Maybe I'll be able to afford one vacation or maybe two in my lifetime, if the dollar doesn't rip away from me. But what does Bitcoin, the lowercase b, do for me? It preserves my future purchasing power better than any other investable asset. So on the volatility side, why do you say that?

This is interesting. Why do you say that? What is your forecast of what Bitcoin will be 10 years from now? Dr. Laffer, that's a great point. 10 years. That's not the time frame. I'm 40, but 10 years is not my outlook. Because in 10 years, my daughter will be 15 years old, still in private school, knock on wood. And then the other three boys will be in private school as well. So those tuitions are going to be compounding for me. So in 10 years, I'm knock on wood preserving. I'm

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going to have, it's probably going to be like 10 to 15 years outlook. And it's not like a dollar denominated number. It's more of my costs and my aspirations. No, that's what I want to know. I'm talking not about dollars. I'm talking about what the cost, what will it be the price level in Bitcoin b? It's going to be greater than it is today. How about if you were three years ago, what would you have said? Well, didn't Bitcoin get up to about \$60 there for a little bit? \$60,000 yet. \$60,000, \$70,000. What car is that sharp drop? Yeah, this is a good point, Alex.

I'm just saying 10 years ago, you know, maybe Bitcoin could have bought you a nice bicycle. And then a few years later, it bought you a nice phone. And today can buy one Bitcoin can buy you like like an okay car. I think that in 10 years, it'll buy you a pretty good house anywhere in America, one Bitcoin. That's the way I think about it. I don't think about it in dollars or in whatever.

It does have the volatility there. Yeah, it's got to be volatile.

Volatile up into the right over as long as... Well, look, if governments could be trusted not to devalue currency into platform people, then we wouldn't need Bitcoin and people would stop feeding it energy and it would die. But that's not going to happen. That's not going to happen. That is the point, is that this replaces government currency. It replaces the dollar.

And you're going to tell me we need to now make sure Bitcoin stays stable in terms of goods and services. But there's still, I think to Alex's point, there's still a lot of room for Bitcoin to grow. The demand hasn't been fully saturated. And I also think you need to look at Bitcoin's preservation of purchasing power over longer time horizons than just two or three years.

Like if you even just get it over a four year time horizon, Bitcoin is above where it is and it continues to compound over time. So it's like in four years, I believe Bitcoin will be greater than it is today. Will it stabilize at any point in time? Hypothetically, under a full monetization of Bitcoin, it stabilizes over time because... Then the asset value of Bitcoin will drop dramatically if its returns are lowered. If you don't have that forecast in the future of a house to 10,000, 300 houses, the expected returns will drop. The characteristics of Bitcoin are retained despite a subdued appreciation. I can still divide my Bitcoin. I can still port it. I can still wholly own it. I can still send it across the world. Yes, all that's true. But the expected appreciation will go down and therefore the value of the Bitcoin will fall with it.

So we keep talking about everything. Bitcoin is volatile, but what about this future you're talking about on the Bitcoin standard where everything else is volatile to it right now?

I think that's what Alex was giving at. In January of 2020, you could buy like 180 barrels of oil to Bitcoin and now it's over 400. And so there's a way that we're thinking about money and the way we're thinking about value that I think kind of flips on its head in the future. Yeah, but what you want to do is have Bitcoin as the numerator here where relative prices of commodities are going to change. Relative prices of goods are going to change. That is, but if you get a posh or laspares index of all goods and services, what you want to do is have Bitcoin stabilize that bundle. So you'll have a lot of volatility of individuals, but for one up, there'll be one down there so that in purchasing power units, you'll have that value be stable over time so we can make contracts. And the reason we make contracts is because we think there will be volatility and you think one will go up and I think it'll go down. That's why you have contracts, differences of view. Well, I think when Alex talked about volatility in the beginning, he's talking about the volatility of the Bitcoin dollar exchange rate. It sounds like you're talking about volatility once we move on to a Bitcoin standard when anything is denominated. That's what I'm

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talking about 100%. Right. And in that case, once we reach the post subsidy world, there's going to be no more Bitcoin issued. And so we don't care about what the dollar Bitcoin exchange rate is. The only reason I talk about dollar Bitcoin is because I don't think quite as good as well as you guys do. So I think of dollars and goods and then dollars. Bitcoin goods. So then what matters there is the volatility that matters there is going to be the inflation of Bitcoin, how much new Bitcoin is created. And we know from the issuance schedule that inflation is going down

year by year. It's already very low and it'll converge down to zero. And so eventually we'll have everything denominated in Bitcoin. And the only thing that's what's going to happen is we'll just have a finite number of Bitcoin and as GDP grows, everything will be denominated in a finite number of Bitcoin. Then you'll have synthetic Bitcoins because of a financial intermediary system and you'll have producers of Bitcoins with fractional reserve systems. And that's what we'll develop. That's the bank. Yeah, but those synthetic Bitcoins are going to have a massive discount ultimately because they're synthetic. And I can own the real thing, which is not the same thing as gold really, because it's so hard to move gold around. So this is the difference. But the financial intermediary will owe a certain amount of Bitcoin as reserves and then it will issue liabilities and set assets on it, make loans on Bitcoins and they can keep that a run. There's no reason why that should lead to a depreciation of the value of those Bitcoins. Credit creation I think is still valuable in a fully color. I think it's hugely valuable with Bitcoin. Why not? To Alex's point, I mean that would only work if those financial institutions were extremely transparent with how much Bitcoin they held and what they were doing with that Bitcoin. And I think you can do that in a way with Bitcoin that you can't do with previous monies just because of the opaqueness. Well, I think it would be transparent. I mean, that's one of the things that the government did do prior to 1913 was have audits of banks. That they did. They went around to all the banks and checked their reserves, their currency and the gold and their reserves. That they did do. But that was their only function was to say the reserve claims of the banks. And that would be perfect transparency. But then you don't need to have continuous deflation going on with a fixed quantity of Bitcoin and growth. You wouldn't need that. You could have a supply of Bitcoin money, transactional, equal to the growth of GDP if you want to say velocities were fixed. I wouldn't say that. So I think in the Bitcoin community now, this idea of paper Bitcoin is pretty controversial and there's probably resistance against it. I think primarily because of what happened under the fiat regime when you have a central bank that's managing all this fractional reserve banking. I think there probably is a way to design this in the future where you could have disciplined Bitcoin paper. But I think right now that's not a conversation people want. That's the conversation I'd really like to. The only way you'll lose on that one is if there's some one world government that can enforce it everywhere in the planet. And then you have to have it in Mars or in Jupiter or maybe. Well, even in the US, pre-civil war, we had before there was a central bank, there were banks like the Suffolk Bank in Boston that would issue their own bank notes on top of gold. And the banks would discipline each other. So in Scotland had something like this. There you go. You got the point. That's exactly a cork. That's exactly what I started the conversation with here. Yeah, that's right. Yeah, Randy Krosner had a paper on this at Chicago when I was there. We talked about this. Were you trained in Chicago? Yeah, I was. I undergrad and I taught there actually

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for several years after my PhD. What topic area? I was in finance and accounting.

Yeah, I got my PhD from Stanford just like you actually. So we have that in common.

God, I'm my condolences to you.

That's right. Were you an undergraduate at Yale? No, no, no, my undergrad was at Chicago.

But my. Well, I thought there only 10, I thought there only 10 years going through all the ranks.

It's a great place, right? If you think about it. I'm one of the best university in the world,

at least it was. 100%. It's the best. Now that you and I have left, it's deteriorated a lot.

Rules versus discretion, right? This was the debate of Freeman and John Taylor.

Freeman wanted a quantity rule and he was wrong on that. You need a price rule because people don't care about the quantity of money. They care about what the price of something is.

Yeah. And he also did. Well, he also did want constant inflation, three to 5%.

Yeah. Well, that's because he wanted to fake that you could take a price for a quantity rule and make it into a price rule by time. And that's just bullshit. Excuse me.

That's just masculine. But one thing he did say, which is consistent with Bitcoin, is that he did say that it doesn't matter so much what the rule is, as long as there is a rule.

Rules are important. I don't disagree with that. But it does matter what the rule is.

Maybe in the first best world, it matters, right? Given that the world has no rules right now.

What you want to do is make sure people in the government don't control the game.

Right. And rules stop that. But there are some rules that are even worse than people.

Right. Yeah. But Bitcoin is not that bad. Not that.

You take a price primal and a quantity dual, and how do you do it?

The difference between a tariff and a quota. Why would you have a quota on a trade or a tariff?

The two are not the same. It depends upon us to test stochastic excess demand functions, what the results of those two systems are. And in this case, we want stable prices,

not stable quantities. Yeah. We really do. And this is where Mandel and I and some of the others really did beat the monitors on this. And then the monitors claimed that a quantity rule would

give price stability. Nonsense. That's not true. I would point out that there is actually a lot of real-world data within the crypto ecosystem that I think we can use to decide what the market

really wants. So a few times, you brought up privacy and anonymity. There are a number of different projects that have made that their primary focus. And I would say those have not

done very well from an adoption and value standpoint. There was an entire multi-year war within Bitcoin about whether it should be a store of value or a medium of exchange.

And there are multiple versions of Bitcoin now that have forked off. They've created their own networks that were meant to be better medium of exchange. The valuation of those networks is less

than 1% of Bitcoin at this point in time. However, on the flip side, stable coins have had massive adoption. So there clearly is demand for a more stable value. Multiple characteristics. Why it

can't be a store of value as well as a medium of exchange, as well as anonymity. If you can get all of those characteristics together, you'd have a winner. No one wants to have you know every transaction you ever made. That hooker last week would really be upset. Just kidding.

I think the short version is there is no perfect money. I would say even Bitcoin is far from

perfect. Come on, Jameson, because you know all the risks in return here. We're here to make a better world, maybe not a perfect world, but I'm not willing to sacrifice perfection. I want to run

for that too. That's well said, Dr. Laffer. While we're having this discussion and this brainstorm,

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I sent instant final settlement. Eric, remind me, where are you in the world again?

Yeah, I'm in Nairobi, Kenya. So in Nairobi, Kenya, Dr. Laffer, while we're having a awesome riverside conversation, I don't even know how much I send you. Maybe even a dollar. I don't know how many sats that was. Yep, there you go. All done. Costs a fraction of a fraction of a sat via, yeah, basically nothing. You're absolutely right, Kathy. That's a beautiful thing about Bitcoin. It just works. But don't give up the ghost, Jameson. You can get all those characteristics in there. It's neither one nor the other. Let's not go down the governance rabbit hole of how difficult it is to change Bitcoin. Jameson, you got to send them the Who Controls Bitcoin piece. Sure. There are a lot of follow-up pieces that I'm sure will be sending over to Dr. Laffer. Remember our conversation, I was able to invest in the big fund? Yes, that is it. I hope this is off. I just want you to know.

Well, Kathy, are you seeing anything else before we wrap up that you want to touch on?

Yeah, I really enjoyed this conversation. I think the biggest thing is it actually seems like we're really on the same page with so much. And Dr. Laffer, your sort of point of view is one where I think a lot of Bitcoiners are hesitant to fully embrace just because it's a walk before we run kind of situation. I'm feeling there's a global financial crisis brewing right now. I don't know if it's China, Japan over-leveraged now that its interest rates are going up. I'm seeing all kinds warning signs out there. So when when Art, Dr. Laffer says that this could happen much more quickly, I think back to the regional bank crisis just in this March, Bitcoin goes from 19,000 to 30,000. What's that? Flight to safety, fear of counterparty risk. So, you know, I have been with Art through many crises and these things do happen more quickly. And it's just like our classic experiences, you know, you get the run-up, you get the run-downs, those things. And, you know,

if you get the settlement in here with the bank where it becomes the world currency, you know, everyone wins. Although it's not just an investment, it's also against the economics of the world. That's really well said. So, let me maybe wrap now. If anyone else had any closing thoughts that they'd like to share. Again, thank you to everybody. Thank you, Kathy. Thank you, Yassine. Thank you,

Dr. Laffer, Jameson, Alex, Eric, Kurok. This was truly a pleasure for the folks that are still listening. If you haven't checked out either of the past two episodes, you can subscribe on Art's YouTube channel and go to the dedicated Bitcoin brainstorm playlist. We'll also link to it in the show notes as well. Thank you very much.

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