

Whistle-stop tour of blockchain developments 1H 2021

Q&A with Keith Bear and Michel Rauchs

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For professional investors/qualified investors/qualified clients only.



Keith Bear is a Research Fellow at the Cambridge Centre for Alternative Finance (CCAF) and an Associate Partner at Elixirr Consulting.



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Recently, Invesco caught up with blockchain experts Keith Bear and Michel Rauchs to discuss the latest developments within the blockchain ecosystem, separating hype from meaningful developments, and providing more nuance to potentially misunderstood blockchain topics like cryptocurrencies, energy usage, NFTs and CBDC. Here are some highlights of our conversation.

Click [here](#) to listen to the full podcast episode.

Invesco: Welcome, Keith and Michel. Going straight into our topic, what is a significant development in the blockchain world in 2021 versus something that is more just hype?

Keith:

Over the last 12-18 months there has been significantly increasing institutional interest in digital assets and more specifically, crypto assets.

Michel:

As a reminder blockchain really means a sort of shared recordkeeping system that is jointly maintained by different parties. It encompasses so many different things, which is why the ecosystem just keeps expanding really in all directions. But what most surprised me in meaningful developments was the recent announcement of El Salvador to make Bitcoin legal tender. This was something that I wasn't expecting to take place this decade, to be honest.

Keith:

In terms of hype topics, in the non-fungible token (NFT) world, the amount sold has fallen down quite significantly from \$176 million in May to about \$8.7 million on June 15th. So, the bubble may not have burst, but it certainly reduced in size a bit.

Invesco: A lot of people seem to be scratching their heads about NFTs. What are they? And what is someone really owning in an NFT?

Keith:

Essentially, NFTs use the characteristics of tokens implemented on a public blockchain to represent ownership of a unique asset, and therefore being able to record the transactions and the provenance of a particular digital object. You can also program in the ability to have royalties and understand any commercial change that might happen when a particular digital object changes hands.

The one I quite admire is Injective Protocol. They bought a Banksy picture for \$95 thousand, burnt it while videoing the whole procedure, and having already taken an image of it, they then made these images available as assorted NFTs. And the interesting thing is those NFTs sold for \$380 thousand. So that just illustrates, some of the strange things that are happening in this world.

While NFTs represent ownership of a digital asset, the NFT itself doesn't necessarily contain the digital assets. Typically, NFTs point on the Internet to where that digital object sits. So, what happens if the digital asset isn't there? What does ownership mean in a legal sense and in terms of the intellectual property? Those are broad, open questions which aren't necessarily resolved because so much is going on.

Michel:

People are scratching their heads because we generally don't know what we own through an NFT. In the Injective Protocol example, the NFT owner essentially owns bragging rights. And apparently that is valuable to some people.



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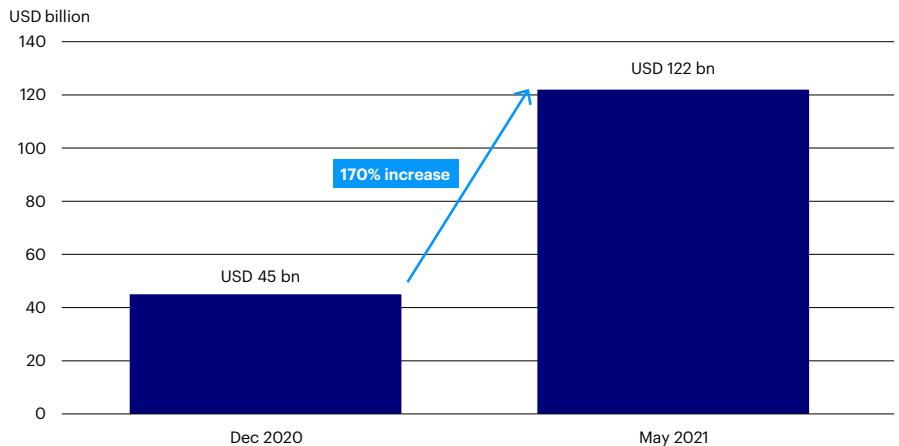
Invesco: While none of us try to predict the future, what stands out to you as some of the key developments for crypto currencies?

Michel:

It's become clear that crypto currencies are increasingly considered by the market as an alternative asset class. That could already be seen in 2017. But the institutional infrastructure wasn't yet ready to support professional investors. That has completely changed over the last three or four years. We've seen a massive increase in the number of regulated trading platforms, which are catering to institutional investors.

Existing asset classes are already at very high-priced levels, and yields are very low. So, the general quest for yield creates an increased interest in crypto currencies as well.

Figure 1
Growth of cryptocurrency institutional investing



Source: Coinbase as at May 2021

Invesco: A rapidly growing space within the blockchain ecosystem is DeFi, which the DeFi Pulse website estimates at about \$58 billion as of the 17th of June in terms of total value locked (TVL). What are the major use cases of DeFi, and what does it stand for?

Michel:

Yes, DeFi is a really interesting, quirky, fascinating thing that emerged on top of public permissionless blockchains. Essentially Decentralised Finance, or DeFi, is an entire financial services ecosystem. It's outside of traditional finance and operates on native crypto networks. So, for instance, you can implement typical financial services through smart contract code, reducing the number of intermediaries.

And because it's all permissionless, the underlying code is open source, so anyone can use it and combine different applications together, using different code bases, which creates an infinite design space in terms of what financial services you could create.

Invesco: A lot of DeFi applications have been around lending, borrowing and exchanges. But, Keith, could you add a little bit more colour and explain some of the specific use cases?

Keith:

Yeah, sure. So maybe a way of answering that question is to look at the kind of layers, if you like, within DeFi. So, as Michel mentioned, the bottom is really the public blockchain, mostly Ethereum at the moment, but not always, which basically acts as a settlement layer for all the transactions that have taken place.

Sitting on top of that side are the assets themselves. So, the crypto assets that we've talked about in the previous part of the conversation, but also very importantly, the stable coins – Tether and others – that are a fundamental component of this ecosystem.

Then, sitting on top of that are the actual applications that include for instance decentralised exchanges or DEXes. They may differ from what we're used to in the traditional financial markets world, in that they may not have a central order book and not do trade matching in that context. They may instead have automated market makers and different mathematical constructions to determine what the price is going to be for the exchange of one crypto asset for another.



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There's a huge amount of innovation that's happening [in DeFi], a new financial system in some respects that's being developed, but outside of the auspices of regulators.

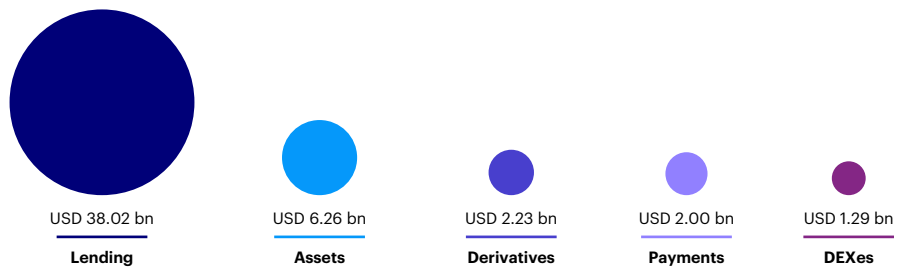
In addition, as you touched on, there's the whole world of credit and lending and yield farming, as it's called. There are also then a set of applications networks that provide exposure to derivative products. And then finally, insurance.

As you can see, essentially what we're witnessing is the replication of traditional financial infrastructure and products, albeit in a very different format, with a very different set of norms and in an unregulated environment as well.

Then on top of that, as Michel talked about, there is an aggregation layer, combining functions from the lower layer as if they were Lego blocks, if you like, thus facilitating activities such as yield farming across multiple underlying platforms.

There's a huge amount of innovation that's happening, a new financial system in some respects that's being developed, but outside of the auspices of regulators in the main and obviously, with a lot of risks.

Figure 2
DeFi use cases
(USD billions locked value)



Source: DeFi Pulse as at 6 July 2021.

Invesco: On the point about potential risks, what do you see as the risks with DeFi? Are there some unintended consequences there?

Michel:

Absolutely. Because it's a permissionless environment it also means that you, as a user, are responsible. If something goes wrong Ethereum doesn't have a customer service line to call. So, once you've essentially messed up a transaction, and the money is gone, there's no way to get it back. And that creates a completely different risk profile environment than we're used to in traditional financial services.

As a result, the way typical users are interacting with those smart contracts and the blockchain happens increasingly through centralized intermediaries. These have the exact same benefits you get from a traditional financial service provider. And, in many cases, those service providers are regulated very similarly to their traditional counterparts. Consumers just want to have convenience and security. Bitcoin started out to essentially reduce the number of intermediaries. After more than 10 years now, it's fair to say that blockchain has created more intermediaries than it has displaced.

Invesco: Speaking of Bitcoin, one of the headlines was the concern about ESG issues with blockchain, specifically Tesla no longer accepting Bitcoin because of the energy usage to mine it. Is there more behind the headlines?

Michel:

People tend to conflate assets and blockchain networks with specific consensus mechanisms. Here, we're really talking about public permissionless blockchains that run on a so-called proof of work mechanism to reach decentralised consensus. It's a process where you must prove that you've expended resources, in this case burning electricity to solve a computational puzzle. In exchange, you get proportionally rewarded to the 'work' you provided.

So, what part of the ecosystem are we talking about? Really, it's mostly Bitcoin, which is responsible for roughly 90% of all the electricity consumption of blockchain networks.

However, a trend that started a few years ago is that most new blockchains use alternative consensus algorithms that have negligible energy implications. These alternatives use similar levels of electricity as traditional information systems, like data centres. There's no material difference.



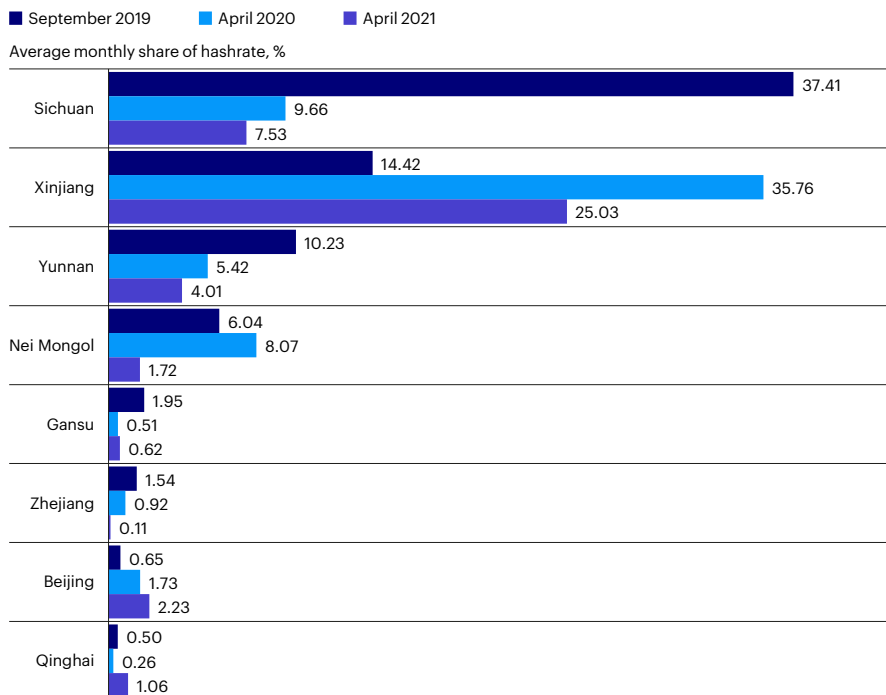
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To calculate the real environmental footprint of Bitcoin, you would need to know where all those different mining farms are based and what energy sources they use. We've actually done quite a lot of work on that over the last two years on our website: <https://cbeci.org/> —the Cambridge Bitcoin Electricity Consumption Index.

The next, missing step, which we're working on right now, is to link those two inputs together into a carbon emissions model. And that should be the crux of the discussion: what is the net basis of Bitcoin's impact on climate change, or the environment more broadly?

Figure 3

Seasonality of bitcoin mining locations in China



Source Cambridge Centre for Alternative Finance as at 6 July 2021.

Invesco: According to the World Economic Forum on 17th June, the Ethereum 2.0 update will reduce the energy footprint of its blockchain network by 99%. What are some different ways that blockchain networks work?

Michel:

Yes, the actual number was 99.99%. The consensus process of permissionless blockchain network requires a proving resource. For a proof of work mechanism, the proving resource is electricity.

In the most popular alternative, which is proof of stake, electricity is replaced by deposits of the underlying crypto token. And so, you receive rewards and have a say in what blocks the networks processes in proportion to your deposits. Because you don't burn electricity in that proof of stake process, except for running your normal computer or server, electricity usage naturally plummets.

Keith:

There are other examples in the digital world, of significant energy consumption, besides blockchain proof of work consensus mechanisms. For example, machine learning has high energy demands. I think it was Wired magazine that mentioned the case of Open AI, a firm in San Francisco that developed an application using machine learning to solve a Rubik's cube with a mechanical hand. That whole program consumed about 2.8 gigawatts-hours of electricity, which according to Wired, was at least equivalent to three nuclear power plants running for an hour. Massive energy consumption is not necessarily a topic constrained to Bitcoin itself when there are other examples in evolving technology.



There are other examples in the digital world, of significant energy consumption, besides blockchain proof of work consensus mechanisms. For example, machine learning has high energy demands. Energy is not necessarily a topic constrained to Bitcoin itself when there are other parts of evolving technology.



Recent surveys estimated that over 86% of central banks globally have some sort of experimental research or implementation going on as far as Central Bank Digital Currencies is concerned.

Invesco: There's been a lot of news flow on Central Bank Digital Currencies or CBDC. What are your thoughts and what have you seen in particular?

Keith:

It is expanding at a speed at the moment. Recent surveys estimated that over 86% of central banks globally have some sort of experimental research or implementation going on as far as CBDC is concerned.

Firstly, in China, the electronic yuan pilots which took place in four cities initially are now expanding into Beijing and other places. Four million separate transactions accounting for about \$314 million of value have taken place in the pilot. I was reading just yesterday, for example, that the pilot allows people to have up to \$782 worth of electronic yuan just by using a phone number, i.e. you don't need a bank account or any other kind of ID. That can benefit many economies and help financial inclusion.

Closer to home, the UK, Europe, US, are all considering their approach to CBDC.

In the US, where there's the not-for-profit approach around the digital dollar itself, there's much more focus on building a consensus from a regulatory and a broader stakeholder point of view. This is the work going on between the Boston Fed and MIT, for instance.

The European Central Bank (ECB) is expected to be deciding later this year on whether to implement a digital Euro. The ECB published a very effective report on the consensus for a digital euro, emphasising privacy and security considerations.

And then finally, here in the UK, Bank of England launched a task force on Bitcoin, so-called. And I think we'll all be interested to see how that's going to evolve.

Michel:

The key question about CBDC is really in light of the declining usage of cash everywhere, do central banks have an obligation towards their citizens and businesses to provide a form of public money, or should they leave this to the private sector who currently dominates electronic payments? This is mostly a political question, really, rather than a monetary or technical one. And this is why these decisions to launch CBDC take quite a long time in Western countries.

Invesco: Well, Keith and Michel, thank you so much for a whistle-stop tour around the blockchain ecosystem.

Keith:

It's been our pleasure. Thank you.

Michel:

Thank you. It's been fun.

For more information on blockchain, including the full podcast and a whitepaper explaining the blockchain ecosystem, visit etf.invesco.com

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