

*David Yermack*

# Digital money and other blockchain promises

**JASPER  
LUKKEZEN**  
*Editor-in-chief*

Anyone who, over the last decade, has attended lectures on corporate governance will be familiar with the work of David Yermack. Yermack examines the relationship between CEO compensation and the way in which companies are managed. His best known paper *Flights of fancy: corporate jets, CEO perquisites, and inferior shareholder returns from 2006* is standard fare in such classes, and shows that listed companies allowing their CEO to use company aircraft for private trips have a four percent lower market value on average. For a multinational, those private trips are not all that costly, but the signal they send to the shareholders about the management's quality is.

*In recent years your attention has been focused on digital currency. Why would a scientist doing research into CEO compensation explore virtual currencies?*

“When I began to research CEO compensation 25 years ago, it received a lot of attention in the media due to a number of scandals. But economists did not research it in a structured way. I did, I addressed issues no one had really paid attention to, thus showing that CEOs sometimes display unproductive and selfish behaviour. Due to my findings, among other things, the reporting of listed companies improved. Today, the field of CEO compensation has become more mature

and steady. That is why, for a couple of years now, I have been looking into bitcoins and other digital currencies.

The state of the literature on the digital currency's state is now comparable to that on CEO compensation when I started tackling it. For economists, it is still largely unknown territory with many questions and hardly any answers. Yet, there are a lot of data as to virtual currencies publicly available, and they can be used to answer some of those questions. The answers we have currently arrived at are often surprising.”

*In 2013, you argued that the bitcoin was not a proper currency [see Yermack, 2015]. But when it comes to digital currency, 2013 is ancient history. At the beginning of that year a bitcoin was worth twelve dollars, while at the time of this interview its value is just a little over 2000 dollar. So, is this still your opinion today?*

“The great thing about understanding digital currency is that it forces you to comprehend what money is and what the role of government is. I have been rereading the classics – Milton Friedman and Friedrich Hayek, among others – to see what their thoughts on the essence of money were. In doing so, you actually encounter some remarkable things. For example, the idea of digital currency appears to be older than its technology, and may even be economic in origin. Friedman describes e-money in an interview from 1999, and so some

*Professor Yermack was interviewed in English. Then a Dutch version of the interview was drafted, which was subsequently translated into English and re-edited.*

say he predicted the bitcoin [NTU/F, 1999].

Also history teaches us important lessons. In the mid-nineteenth century, the United States saw a period in which private parties were allowed to print banknotes. For a few decades there were hundreds of issuers active, their reputation being the only guarantee of such notes. If the issuer went bankrupt, your money was worthless. This Wildwest situation generated a lot of uncertainty and high transaction costs, but it also shows that money is not necessarily a public good. This may have implications for virtual currencies, were the government is kept out as well.

But – let's stay on topic – just bring to mind the regular criteria as to what money is. Bitcoin is hardly used for transactions, people don't count in bitcoins – not even bitcoin markets do that – and, because of its high volatility, the bitcoin is also unsuitable as a means of hoarding. Thus, at this point in time, the bitcoin is merely used for speculation purposes.

Still, I think the rise of digital currencies based on blockchain technology is inevitable, due to its potential. First, because digital currencies form an alternative to the current fiat money [money that doesn't derive its value from the material it consists of, but from the confidence that people place in it, JL]. This provides an alternative, should a central bank adopt a bad policy. And it serves to constrain central banks, which can be very useful in countries with a poor monetary policy.

Second, because issuing digital money might be very attractive for central banks [Yermack and Raskin, 2017]. The prime example is 'sovereign money', as to which citizens and non-financial firms hold a direct payment account at the central bank. This is an old idea – deriving from the Chicago Plan of the Thirties [Phillips, 1995] – which only became technically feasible since blockchain appeared."

### *Why might central banks be interested in sovereign digital money?*

"There are three reasons why issuing digital money is attractive to central banks. First, the current fractional banking system – with all the moral hazards, bad incentives and expensive services it entails – becomes unnecessary if everybody puts their money in an account at the central bank. Once accounts at the central bank are used for payments, a bank failing due to bad loans can no longer endanger the continuity of payments in a country.

Secondly, monetary policy will become a lot simpler. With sovereign digital money, subsidies and tax



**DAVID YERMACK**  
is the Albert Fingerhut professor of finance and business transformation at New York University (NYU) Stern School of Business and an Adjunct Professor of Law at NYU Law School

rebates can be given where they are most productive. Also, the zero lower bound no longer forms a real limitation to the nominal interest rate [Haldane, 2015]. With cash currencies the nominal rate cannot get any lower than zero, as people are always able to decide to keep cash in hand, yielding a zero percent interest rate. With digital money, this alternative is not possible.

However, the third reason is the one that will convince central bankers. Blockchain technology offers them an audit trail of all transactions. This means it becomes impossible to transfer money without leaving a trace. Concealing financing sources or money laundering will be much harder, as it is always possible to scrutinize a transaction later on. What's more, due to the way it has been constructed, it is actually impossible to tamper with the ledger [see the article by Everts in this issue, JL]. That may seem trivial, but ever since its creation in 2008 the bitcoin has never been hacked. Contrary to banks, where billions have been stolen by hacking."

*In that respect, sovereign digital money is something very different from the bitcoin, where the government's inability to interfere in it is presented as one of the advantages.*

"I think Satoshi Nakamoto [the bitcoin's designer, JL] has created a design flaw by seeing to it that the amount of bitcoins is always known in advance and only increases slowly. In that case, when the demand for bitcoins

increases, inflation will arise. Nakamoto says this is fine, as long as people know it beforehand. But Nakamoto is not an economist.

According to economists, expected deflation is not fine at all. Historically, expected deflation was one of the main objections to the gold standard. At the end of the nineteenth century, the economy in the United States grew a lot faster than the amount of gold did, initiating a call for an alternative to the gold standard. The Free Silver Movement, which argued to increase the amount of money by minting silver coins alongside of gold coins, was one of the responses to that.

To avoid structural deflation in a healthy economy, the money supply will need to grow at about the same speed as GDP. If you would want to solve this without a central bank, you would have to link the money supply to a GDP measurement that is both simple to carry out and uncontroversial. I think that is a very hard thing to do.”

*The ledger is the cashbook in which all the transactions are registered. How important is this ledger?*

“The ledger is the crucial element that makes the blockchain technology’s disruptive nature possible. Since all information in the ledger is accessible to everyone, a central counterparty (CCP) is no longer needed, and neither are concerns about data integrity. So, the costs of verification, validation and fraud control can be greatly reduced.

This is a clever cryptographic feat that has far-reaching practical and philosophical implications for the concept of money. Practically, without a CCP, you are back in the era of free banking, when everything boiled down to the issuer’s reputation and regulation was of no consequence. This is how the bitcoin works today.

More philosophically, Kocherlakota [Kocherlakota, 1998] states that one can regard money as a kind of primitive memory. If you have money, it is a claim that you have done something productive in the past. By paying with that money you lose this claim, as it is transferred to the person who provides you with a good or a service. From money however you are unable to discern the claim’s origin, yet you might do so from some memory or database of productive contributions. For, this would reflect these claims and also indicates their origin. This is precisely what a digital currency based on the blockchain is: an improved form of the primitive memory that money is.”

*The last couple of years I’ve heard more about blockchain than about digital currency. How has this happened?*

“The world is gradually realising that digital currency is just one of blockchain technology’s applications. All sorts of applications that use a common database can become safer and cheaper when carried out by blockchain. From real-estate and art registers to decentralised power generation and corporate governance [Yermack, 2017] – everywhere blockchain makes the central database plus the required trust in its administrator superfluous. The single point of failure, which the central database plus its administrators constitutes, becomes obsolete when the same database is stored in various places and cannot be tampered with.

The next step is to link these blockchain databases to the automated execution of contracts. Examples are rented cars that drive themselves back to their owner’s garage when rent isn’t paid or they are driven recklessly. Automated execution prevents ‘strategic behaviour’ – in this case of people driving cars they do not own. As the probability of non-payment and risk of damage is reduced, rental cars could become a lot cheaper.”

*I can well imagine there are all sorts of objections here.*

“Yes. Apart from the moral and practical objections against automatically executed contracts or automatic jurisdiction – all that will of course have to be looked into – there are three problems as regards using blockchain technology in digital currency, which make one apprehensive as to other blockchain applications.

The first one is that peer-to-peer systems expect the user to take more responsibility than centrally organized systems do. If you forget your private key, your password, you will never be able to spend your bitcoins – you can only look at them. But if, on the other hand, you lose your debit card, you can still access your money by visiting your bank. Something similar goes for the deposit guarantee scheme. Without a deposit guarantee, you will need to acquaint yourself with the counterparty’s financial state. And dealing with this greater responsibility will not be easy for everyone.

The second drawback regarding blockchain technology is that changing the system can be difficult. As to the bitcoin, it has probably intentionally been kept rather vague who is authorized to make changes to the system. It seems that a vast majority of the miners (those looking for new bitcoins) must agree upon any

amendment of the rules before this can be implemented. For two years now, there has been no consensus on whether or not to increase the size of the blocks. Larger blocks could increase the speed of transactions.

And the third is that miners controlling a simple majority of computing power, will be able to tamper with transactions, and for instance might re-route third-party transactions to their own accounts. This is a theoretical possibility – for, in the past this hasn't happened when coalitions of miners had a majority.”

*Of course, the blockchain's emergence will double the number of supervisors, lawyers and accountants yet again.*

“I don't think so. Certainly not in the long run. If data are always safe and reliable, there is no need for supervision by auditors. And with automatically executed contracts and perhaps also jurisdiction, we won't need as many lawyers by far. On the other hand, the future looks very bright for data scientists who are able to deal with a probabilistic approach. Which, for that matter, also requires a change in mentality.

*A mentality change?*

“Currently, we base ourselves upon legal certainty: in cases of conflict we turn to mutually agreed texts, such as letters of credit, and rely upon them due to the legal system. Yet, we will have to base ourselves upon statistical certainty. If settlements are implemented through the blockchain, certainty will depend on whether all parties accept the block containing your contract. The probability of this happening increases as the length of the chain containing your contract grows. The reverse probability – that there arises an even longer chain that does not contain the block with your contract – decreases exponentially. At some point this becomes negligible, but it is never completely zero.

This changing concept of certainty requires a mentality change. Which of course is nice for an economics professor who knows something about statistics – and it is certainly great if you can teach this to law students, as I do – but it may be quite scary if you are in the middle of a wonderful career at some regulator or accountancy firm. Then all of a sudden your career is at risk.”

*What options do these people have?*

“As I said, there will certainly be a demand for data scientists and statisticians. And it may well be that one of the big four will jump on the blockchain bandwagon

– I can, for instance, imagine Ernst & Young running a statistical audit of your blockchain. But overall I think the number of people in these professions is going to drop by fifty percent.

An exception here might be competition surveillance. Due to the blockchain technology's structure, there are strong incentives towards market concentration, which could be harmful or costly to users. I think it is wise to pay close attention to this issue.”

#### LITERATURE

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