

# The economy of bitcoins

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ETH's researchers decipher the dynamics behind the cryptocurrency Bitcoin.  
Credit: BTC Keychain/flickr.com

The massive spread of the cryptocurrency or digital currency, Bitcoin, opens up new pathways for researchers to study social action on markets. This reveals interesting feedback between the exchange rates and mentions in social media.

Anyone who strolls around the Kreuzberg district of Berlin, can't help but notice them – the small signs on the doors of shops and cafes "Bitcoins accepted". Customers pay for their shirt or their cappuccino with their Smartphone instead of with bank notes or credit cards. The [digital currency](#) Bitcoin makes all this possible. "The image of Bitcoin

has changed fundamentally", explains David Garcia, a post-doctoral researcher with the Chair of Systems Design held by Professor Frank Schweitzer. "Bitcoins used to be the reserve of hackers and computer nerds. Today, hipsters pay for drinks with them and they are accepted in the online shops of large companies". Garcia, together with his colleagues Claudio Tessone, Pavlin Mavrodiev and Nicolas Perony, has just published a study on the social dynamics of the Bitcoin economy in the *Journal of the Royal Society Interface*.

## **Internet activity determines exchange rates**

For research the success of the digital currency (see box) is a stroke of luck as all data on every transaction carried out in Bitcoin are available in anonymised form on the Internet. Consequently, Garcia and his colleagues are able to study the Bitcoin economy using corresponding algorithms. This idea saw the light of day when they noticed that the 50,000-fold market value increase in the digital currency in just three and a half years went hand in hand with a 10,000 percent increase in Google searches for Bitcoin. The researchers hypothesise that the increase in the value of Bitcoins is markedly accelerated by activities on the Internet, in particular the search for information and interaction in the social media.

To test their hypothesis the researchers examined four different socio-economic parameters: the development of the Bitcoin user base, the price developments of the currency over time, the search for information about Bitcoin on Google and in Wikipedia (more than six million inquiries) and the exchange of information about Bitcoin on Twitter (almost seven million Tweets). In fact, over the past three the researchers established years major correlations between price developments, the number of new Bitcoin users, searches on the Internet and Tweets.

At the same time, they discovered two positive feedback loops which

basically reproduced the laws of the "analogous" economy. The growing popularity of Bitcoins on the Internet leads to growing demand which, in turn, encourages activity in the social media. This all results in a higher price for Bitcoins. The second feedback concerns the user base: the more users become part of the Bitcoin transaction network, the higher the price because Bitcoins are not issued in line with demand but in an automated fashion at regular intervals. This means it is possible to calculate the available amount at any time. One negative feedback is, however, surprising. Prior to a major slump in the price of the currency, there was a dramatic increase in Bitcoin activity on the Internet. "Big changes in Internet and [social media](#) activities lead to substantial price fluctuations", comments Nicolas Perony, co-author of the article.

## **Understanding markets and social dynamics**

Perony is convinced that the quantitative analysis of social phenomena on the Internet has major potential. "With digital currencies we can observe aspects of the economy that we didn't have access to with cash. This gives us greater understanding of how markets actually function." According to the authors, the methodology described in the article could be applied to other areas in society, too. The Bitcoin mining network, which issues the currency, already harnesses computing power today which is three hundred times bigger than that of the 500 most powerful supercomputers together. "The big question is how such a high-performance system could be used for collaborative activities which go beyond the production of money", comments Perony. One possibility would be, for instance, collaborative research in a global network or the decentralised ownership of specific goods managed by a global network. Bitcoins do not belong to anyone. Buyers merely acquire the right to use a specific amount of them. This study already outlines today the tools for accurately quantifying and analysing the [social dynamics](#) of collaborative systems of this kind in the future.

## The meteoric rise of Bitcoin

The Bitcoin success story began in 2008 with an article about an alternative, digital currency published under the pseudonym Satoshi Nakamoto. In July 2010 Bitcoins were traded for the first time on the Internet exchange Mt. Gox at a rate of US\$ 0.06 for 1 Bitcoin. The total value of all Bitcoins was US\$ 277,000. By the end of 2013 the market value of all issued Bitcoins had climbed to more than US\$ 14 billion whereby during spikes more than US\$ 1,000 were paid for one Bitcoin. Today, over four million people use the digital currency. Bitcoins are traded in euros, dollars and in Chinese renminbi. Unlike conventional currencies there is no central bank for Bitcoins which has a monopoly for printing money. New Bitcoins are generated by what is known as mining via a global computer network – currently at a rate of 25 Bitcoins every ten minutes. Transactions are likewise verified and carried out on this network. Even the bankruptcy of important Bitcoin trading exchanges and negative headlines about money laundering and drug purchases on the Internet were not able to undermine confidence in the currency. A few days ago the PC giant Dell announced that it will henceforth accept Bitcoins as payment for products in its online shop.

**More information:** Garcia D, Tessone CJ, Mavrodiev P, Perony N. The digital traces of bubbles: feedback cycles between socio-economic signals in the Bitcoin economy. *J. R. Soc. Interface.* 2014 11 20140623; [DOI: 10.1098/rsif.2014.0623](https://doi.org/10.1098/rsif.2014.0623) (published 6 August 2014)

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