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Some stylized facts of the Bitcoin market

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HIGHLIGHTS

- We study statistical features and long-range dependence of Bitcoin returns.
- Hurst exponent is computed for sliding windows.
- Liquidity does not affect the level of long-range dependence.
- Similar behavior of Hurst exponent at different time scales.

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ABSTRACT

In recent years a new type of tradable assets appeared, generically known as cryptocurrencies. Among them, the most widespread is Bitcoin. Given its novelty, this paper investigates some statistical properties of the Bitcoin market. This study compares Bitcoin and standard currencies dynamics and focuses on the analysis of returns at different time scales. We test the presence of long memory in return time series from 2011 to 2017, using transaction data from one Bitcoin platform. We compute the Hurst exponent by means of the Detrended Fluctuation Analysis method, using a sliding window in order to measure long range dependence. We detect that Hurst exponents changes significantly during the first years of existence of Bitcoin, tending to stabilize in recent times. Additionally, multiscale analysis shows a similar behavior of the Hurst exponent, implying a self-similar process.

1. Introduction

According to the traditional definition, a currency has three main properties: (i) it serves as a medium of exchange, (ii) it is used as a unit of account and (iii) it allows to store value. Along economic history, monies were related to political power. In the beginning, coins were minted in precious metals. Therefore, the value of a coin was intrinsically determined by the value of the metal itself. Later, money was printed in paper bank notes, but its value was linked somewhat to a quantity in gold, guarded in the vault of a central bank. Nation states have been using their political power to regulate the use of currencies and impose one currency (usually the one issued by the same nation state) as legal tender for obligations within their territory.

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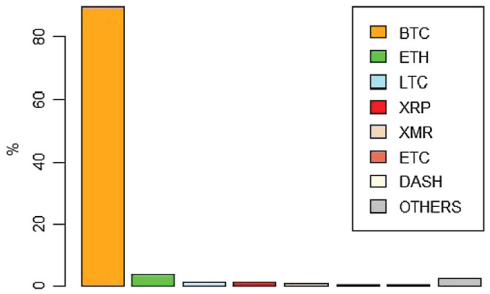

Fig. 1. Cryptocurrencies. Share of market capitalization of each currency.
Source: Own elaboration based on data from [1].

In the twentieth century, a major change took place: abandoning gold standard. The detachment of the currencies (specially the US dollar) from the gold standard meant a recognition that the value of a currency (specially in a world of fractional banking) was not related to its content or representation in gold, but to a broader concept as the confidence in the economy in which such currency is based. In this moment, the value of a currency reflects the best judgment about the monetary policy and the "health" of its economy.

In recent years, a new type of currencies, a synthetic one, emerged. We name this new type as "synthetic" because it is not the decision of a nation state, nor represents any underlying asset or tangible wealth source. It appears as a new tradable asset resulting from a private agreement and facilitated by the anonymity of internet. Among this synthetic currencies, Bitcoin (BTC) emerges as the most important one, with a market capitalization of 15 billions, as of December 2016. There are other cryptocurrencies, based on blockchain technology, such as Litecoin (LTC), Ethereum (ETH), Ripple (XRP). The website https://coinmarketcap.com/currencies/ counts up to 641 of such monies. However, as we can observe in Fig. 1, Bitcoin represents 89% of the capitalization of the market of all cryptocurrencies. One open question today is if Bitcoin is in fact a, or may be considered as a, currency. Until now, we cannot observe that Bitcoin fulfills the main properties of a standard currency. It is barely accepted as a medium of exchange (e.g. to buy some products online), it is not used as unit of account (there are no financial statements valued in Bitcoins), and we can hardly believe that, given the great swings in price, anyone can consider Bitcoin as a suitable option to store value. Given these characteristics, Bitcoin could fit as an ideal asset for speculative purposes. There is no underlying asset to relate its value to and there is an open platform to operate round the clock.

The aim of this paper is to study some statistical characteristics of Bitcoin et al.vis-à-vis some major currencies, during the period 2011–2017. We will focus our attention on the evolution of the long memory of the time series. This article contributes to the literature in three important aspects. First, we expand the empirical studies by analyzing the long memory of a new asset. Second, we compare the behavior of Bitcoin with some major currencies. Third, we highlight the evolution in the underlying dynamics of this new market. The rest of the paper is organized as follows: Section 2 describes the recent emerging literature on Bitcoin, Section 3 describes the methodology used in the paper, Section 4 presents the data and results of our empirical analysis and, finally Section 5 draws the main conclusions.

2. Brief literature review

2.1. Bitcoin

Speculation has a long history and it seems inherent to capitalism. One common feature of speculative assets in history has been the difficulty in valuation. Tuplipmania, the South Sea bubble, and more others, reflect on one side human greedy behavior, and on the other side, the difficulty to set an objective value to an asset. All speculative behaviors were reflected in a super-exponential growth of the time series [2].

Cryptocurrencies can be seen as the libertarian response to central bank failure to manage financial crises, as the one occurred in 2008. Also cryptocurrencies can bypass national restrictions to international transfers, probably at a cheaper cost. Bitcoin was created by a person or group of persons under the pseudonym Satoshi Nakamoto. The description of Bitcoin Core, i.e. the open source client of the Bitcoin cryptocurrency, is described in [3].

The discussion of Bitcoin has several perspectives. The computer science perspective deals with the strengths and weaknesses of blockchain technology. In fact, according to [4], the introduction of a "distributed ledger" is the key innovation. Traditional means of payments (e.g. a credit card), rely on a central clearing house that validate operations, acting as "middleman" between buyer and seller. On contrary, the payment validation system of Bitcoin is decentralized. There is a growing army of miners, who put their computer power at disposal of the network, validating transactions by gathering together blocks, adding them to the ledger and forming a 'block chain'. This work is remunerated by giving the miners Bitcoins, what makes (until now) the validating costs cheaper than in a centralized system. The validation is made by solving some kind of algorithm. With the time solving the algorithm becomes harder, since the whole ledger must be validated. Consequently it takes more time to solve it. Contrary to traditional currencies, the total number of Bitcoins to