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Should Bitcoin be used to help devastated economies? Evidence from Greece

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Abstract

The worldwide heightened economic uncertainty in countries like Venezuela, India, Britain, and Italy has strengthened more demand for Bitcoin. The deadlock between Greece and creditors doesn't seem to be going away and Greeks are very tired of the most punishing austerity measures connected to repayments of the loans. Greek people, who become increasingly mistrustful of their government, found solace in the Bitcoin as a refuge asset. The novelty of this paper lies in its methodological approach, which can pinpoint the dynamic effects of uncertainty surrounding the debt crisis on the interest in Bitcoin as an alternative to conventional and state-sanctioned banking system. Our findings confirm the great resilience of Bitcoin during periods of turmoil, highlighting its potential safe haven ability against uncertainty.

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1. Introduction

In the onset of the global financial collapse of 2008, the world's economy has experienced sharp changes. There has been a trend towards questioning the standard economic and financial structures which govern the conventional monetary and financial system. This has yielded to global loss in confidence in conventional currencies and the financial institutions. Here, Bitcoin is leading the charge by offering a completely decentralized secure alternative to conventional currencies. Developed in 2009 by a computer programmer using the pseudonym Satoshi Nakamoto, Bitcoin is a relatively new phenomenon. Since its creation, this new digital money has experienced rises and devastating falls. Even though financial experts and analysts have often criticized Bitcoin for being too volatile as an asset and an independent electronic currency, the volatility of Bitcoin has declined at a rapid pace since mid-January 2015 (Bouoiyour and Selmi 2016 a). This was roughly coincided with growing indications that Greece will be unable to meet its debt repayment obligations. As the Greek crisis escalated, the term "Grexit" (Greece's exit from the single currency) was added to the financial vocabulary. The coincidence of the growing talks over Grexit and Bitcoin spikes cannot be accidental. With the mixed views towards Grexit event, cryptocurrencies (in particular, Bitcoin) benefited widely. Some believed that the Grexit from the euro may be inevitable. It is clear that the majority of Greeks want to stay in the eurozone and saw a deal with European creditors. However, the risk of Grexit remains elevated. On January 25th 2015 and with a desire to settle upcoming debt obligations, the left-wing Syriza[1] party received the largest number of votes in Greece's elections. The success of this party, with its radical approach to debt negotiations, has harmed the negotiating process among creditors and the Greek government and has left Greece in a state of limbo. The uncertainty over the debt deal crisis has led to faster capital flight during May and June 2015. This has pushed Greeks to keep their savings in private assets like Bitcoin that may constitute a viable solution rather than depending on the goodwill of banks.

As people turn generally to search engine in turbulent times, the internet search becomes day-to-day a potential tie helping to analyze the investors' behaviors in times of uncertainty. This paper utilizes Google Trends search as a quantitative measure to test whether extracting public sentiments related to "Grexit" affects significantly the Bitcoin price evolution. Recent literature evaluated how online information may effectively predict the Greek debt crisis (Mitchell et al. 2012) and the Brexit event (Bouoiyour and Selmi 2016 b). Millions of users daily interact with search engines, creating valuable sources of data regarding various aspects of the world. Although the frequency of searches of a specific keyword is incomparable to a sentiment index, it can offer partial information which can be used to understand a complex phenomenon.

Given the extreme volatility of Bitcoin prices that has garnered a particular attention and the great uncertainty associated to Grexit, some econometric problems may arise when one wants to examine how behave Bitcoin price –yet defined by several researchers as extremely volatile and speculative asset (for example, Bouoiyour and Selmi 2015; Ciaian et al. 2015; Bouoiyour et al. 2016) – during unstable period. This concerns particularly the noisy non-stationarity and nonlinearity problems. To deal with this problem, the Empirical Mode Decomposition (EMD) has proven to be appropriate in a broad range of applications for extracting signals from data generated in noisy nonlinear and non-stationary processes (for instance, Huang and Shen 2005; Huang and Attoh-Okine 2005). This technique allows

[1]It is a left-wing political party in Greece, founded in 2004, as a coalition of left-wing and radical left parties.

controlling for some irregularities in the Bitcoin market's behavior including nonlinearities, asymmetries, fat-tails and volatility clustering.

The structure of the paper is as follows: Section 2 describes the methodology and data. Section 3 reports the empirical results. Section 4 concludes.

2. Methodology and Data

Throughout the present research, we use a relatively new method to process data as an alternative to Fourier and wavelet based techniques. This technique is dubbed the Empirical Mode Decomposition (EMD) and was initiated by Huang et al. (1998). The EMD technique is dissimilar from the Fourier and wavelet transforms as it handles nonlinear and non-stationary signals. According to Huang et al. (1998), the Fourier transform might prompt inaccurate information dominantly due to the nature of the transform. The Fourier transform is designed to handle linear and stationary signals. The wavelet transform, however, is suited to effectively handle non-stationary data, but it is inappropriate at processing nonlinear data. The EMD has proved to be a useful econometric tool for the assessment of multicomponent signals. It enables to disentangle the original signal into a set of amplitude and frequency modulated zero mean signals, namely intrinsic mode functions (IMFs), and a residual.[2]

After identifying local extremes of time series data $X(t)$, all local maxima are connected by a cubic spline line $U(t)$ generating the upper envelope of the time series, and by another cubic spline line $L(t)$ generating the lower envelope. We, then, measure the mean m_1 for different points from upper and lower envelopes given by:

$$m_1 = (U(t) + L(t))/2 \quad (1)$$

The difference between the original data and m_1 is the first component, which is referred to as h_1.

$$X(t) - m_1 = h_1 \quad (2)$$

If h_1 is not an IMF, we have to repeat the sifting process until it is reduced to an IMF. Then, in subsequent steps of the sifting process, the first component h_1 is treated as if it were the data, that is,

$$h_1 - m_{11} = h_{11} \quad (3)$$

The sifting process is carried out k times until anacceptable level of tolerance is reached:

$$h_{1(k-1)} - m_{1k} = h_{1k} = c_1 \quad (4)$$

If the resulting time series h_{1k} is an IMF, then it is written as c_1, which is the real first component thatsatisfies the definition forIMFs. Equation (2) can be rewritten as follows:

$$X(t) - c_1 = r_1 \quad (5)$$

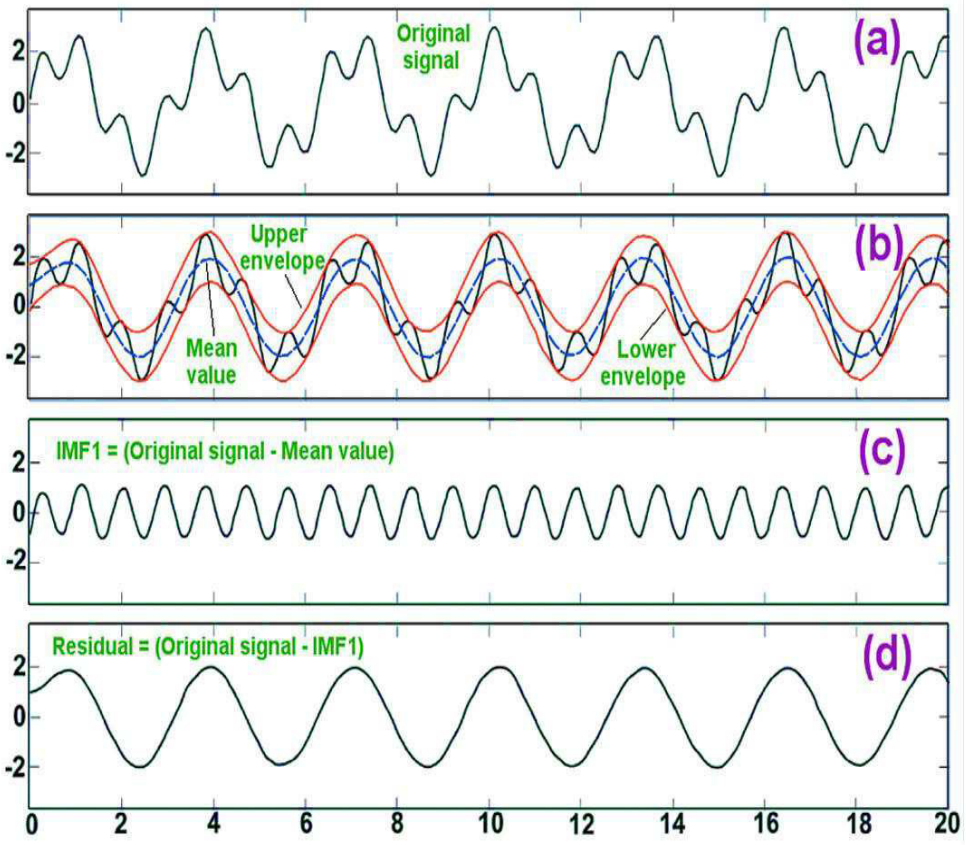
[2] For more details about the way EMD works, please refer to the following link: http://perso.ens-lyon.fr/patrick.flandrin/emd.html

Equation (5) is applied several times until the residue (r) becomes a monotonic function from which no more IMFs can be extracted. The last residue is the trend of the data. Ultimately, equation (5) can be denoted as:

$$X(t) = \sum_{i=1}^{n} c_i + r_n \quad (6)$$

The EMD is illustrated rigorously in Figure 1. Six main steps are conducted to decompose IMFs from a given signal. First, we distinguish the positive peaks and negative peaks of the original signal (maxima and minima, respectively). Second, we construct the lower and higher envelopes of the signal by the cubic spline method (red line). Third, we determine the mean values (blue line) by averaging the higher and lower envelopes. Fourth, we subtract the mean value from the original signal to obtain the first intrinsic mode function component (IMF1). Fifth, we measure the first residual component by subtracting the derived IMF1 from the original signal. We then consider the obtained residual component as a new data and we re-conduct the same process depicted above to determine the next IMF. Ultimately, we perform the aforementioned steps until the final residual component becomes a monotonic function and no more IMFs can be derived.

Figure 1. The Empirical Mode Decomposition procedure



Notes : (a) the original signal, (b) lower and upper envelopes (red line) and their mean (blue line), (c) the first intrinsic mode function component, and (d) the first residual.

After the partition of the signal into a set of different components by employing EMD, a scale-on-scale correlation analysis is conducted to investigate the relationship between

matched modes, even if we control for potential control variables (i.e., the determinants of Bitcoin price). These variables include supply-demand determinants, the speculative contributors, the technical generators (in particular, the hash rate) and the macroeconomic and financial drivers. Precisely, the frequency at which one unit of Bitcoin is used to purchase tradable or non-tradable products for a given period (monetary velocity, MV) may exert a significant influence on Bitcoin. Second, the attention-driven investors' attitudes towards Bitcoin may exert a positive or negative effect on the price of Bitcoin depending on whether good or bad news dominate social media networks (Bouoiyour et al. 2015). To measure the speculative attitude of Bitcoin, we use the daily views from Google Trends by searching the term "Bitcoin". Moreover, the emergence of Bitcoin has provided new approaches concerning payments such as the "hash rate (HR)". HR is the measuring unit of the processing power of the Bitcoin network. It makes an intensive mathematical operation that has a significant impact on Bitcoin purchasers (Kristoufek 2014). Third, Bitcoin is driven by different macroeconomic and financial factors including the Shangai market index (SMI) the ratio between volumes on the currency exchange market and trade (ETR). We use daily data related to Bitcoin (BPI) and the interest to Greek crisis (GRK) over the period from 04/12/2010 to 08/06/2015. We choose this period of study as the attention to Grexit (via Google and Twitter searches) collapsed markedly since June 08, 2015. Notably, the interest to Grexit has risen recently (in particular at the end of June 2016). Table 1 reports all the data used and the sources.

Table 1. Data sources

Variables	Definition	Sources
BPI	The Bitcoin price index	CoinDesk (www.coindesk.com/price)
GRK	The attention to "Grexit"	Google Trends (http://trends.google.com)
TTR	The attention to Bitcoin	Google Trends (http://trends.google.com)
MV	The monetary velocity of Bitcoin	Blockchain(http://www.blockchain.info)
ETR	The exchange-trade Ratio	Blockchain (http://www.blockchain.info)
HR	The hash rate	Blockchain (http://www.blockchain.in
SMI	The Shangai market index	DataStream of Thomson Reuters

3. Empirical results

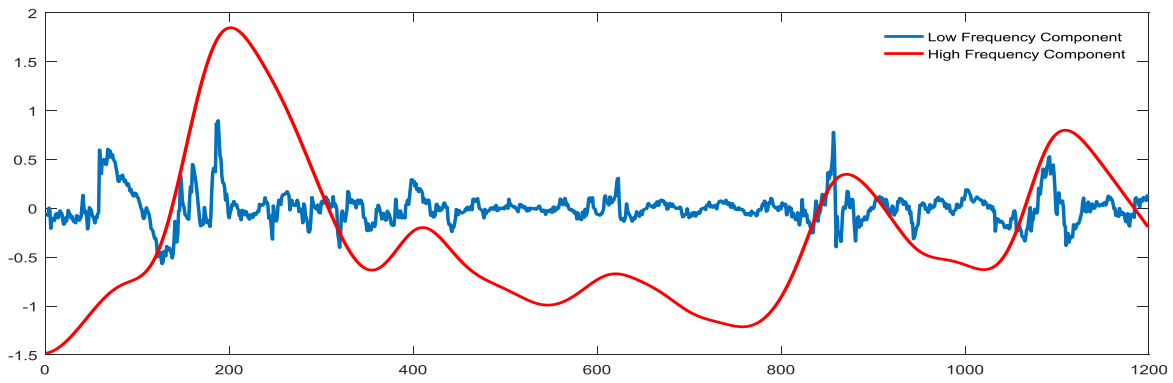
This study examines the relationship between Bitcoin and the attention to Grexit over two sub-periods: the whole period from December 04, 2010 to June 08, 2015, and a restricted period considering the arrival of Syriza to power from January 25, 2015 to June 08, 2015.

3.1. The whole period

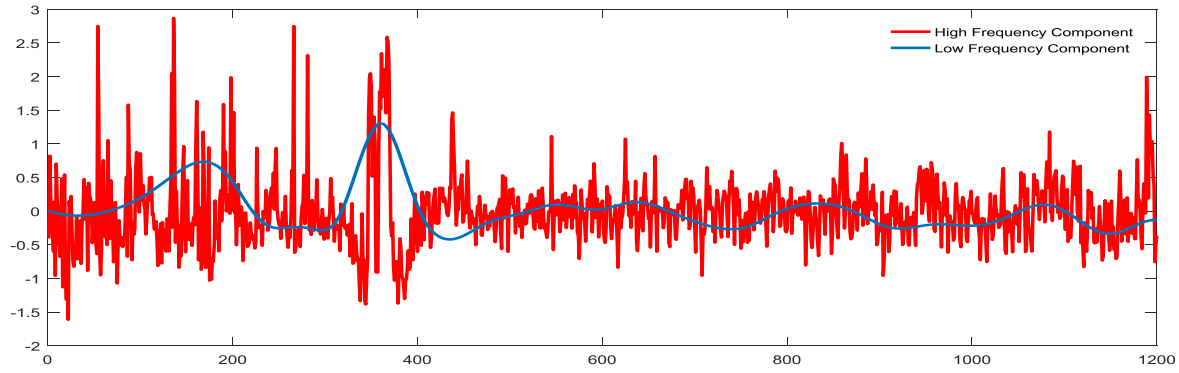
Figure 2 indicates that both Bitcoin price and the attention given to Grexit appear dominantly driven by high frequency components. These results are expected since the Bitcoin market is too volatile and speculative, and the period under study was characterized by a great uncertainty as to whether Greek government will be able to settle the debt deal crisis.

Figure 2. The hidden characteristics of Bitcoin and the Grexit (whole period)

BPI



GRK



To test if the growing uncertainty as to whether Athens can settle its debt crisis affects significantly and positively the price of Bitcoin, we estimate the relationship between the attention given to Greek crisis via Google trends and Bitcoin price via an OLS-based EMD, while controlling for potential Bitcoin fundamentals. Table 2 reports the results. The anxiety over the burly debt crisis increases, even partially (in shortest horizons; IMF1 and IMF2) the Bitcoin price. The digital money that emerges over times of turbulence (crisis) is generally perceived as alternative to conventional currencies. If Greece chooses to leave the eurozone, Greeks will try to seek a secure alternative to the conventional currency, but it is unclear what currency the government will choose. Bitcoin-style digital currency is one of the possible alternatives. It is considered as an exciting currency since it increases markedly over time. But what we reveal from our results is that the capability of Bitcoin to act as alternative currency may hold in the short-run. Expectedly, it is difficult to consider Bitcoin as a currency for a government since Bitcoin supply is fixed and capped. Also, Bitcoin is too volatile, complex and sensitive to multiple speculative, financial and macroeconomic fundamentals.

Table 2. The regression of Bitcoin price on the Grexit (whole period)

	IMF1	IMF2	IMF3	IMF4	IMF5	IMF6	IMF7
C	0.281611	-0.137733	2.918405*	-0.00707	0.281522	0.278814	0.122810
	(0.2524)	(0.8393)	(0.0371)	(0.9820)	(0.2760)	(0.3419)	(0.7776)
GRK	0.622108**	0.650474*	0.895260	0.324009	-0.026138	-0.018209	0.122810
	(0.0075)	(0.0861)	(0.4508)	(0.2109)	(0.1171)	(0.2281)	(0.7866)
ETR	0.122108*	0.157355**	0.109503*	0.033970	0.021178	0.007353	0.334376
	(0.0163)	(0.0046)	(0.0286)	(0.1620)	(0.2743)	(0.6539)	(0.5154)
TTR	0.150096*	0.413582	0.175538*	-0.00188	-0.001289	0.015778**	0.141481
	(0.0995)	(0.5229)	(0.0664)	(0.9202)	(0.9313)	(0.0083)	(0.7520)
BV	0.200407*	0.109192***	0.500618	-0.02395	-0.013544	-0.004435	0.183131*
	(0.0586)	(0.0000)	(0.2603)	(0.4256)	(0.5703)	(0.8405)	(0.0940)
HR	0.034585*	0.031015**	0.080618*	-0.02266	0.063511*	0.064773*	0.068084*
	(0.0212)	0.0018)	(0.0993)	(0.2735)	(0.0405)	(0.0968)	(0.0900)
SMI	0.034585*	0.029768*	0.669454	0.03417	0.1146*	0.198721	0.164051**
	(0.0769)	(0.0187)	(0.6531)	(0.1015)	(0.0456)	(0.2462)	(0.0098)
R2	0.77	0.79	0.75	0.72	0.69	0.69	0.71

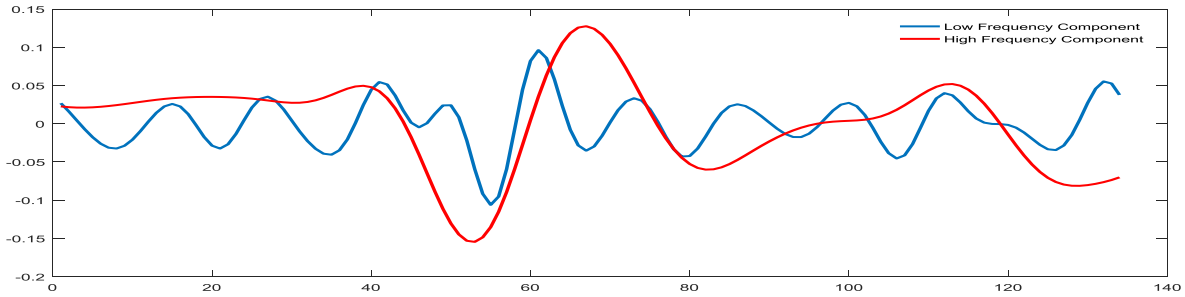
Notes: (.): p-values. ***, ** and * in the table denote statistical significant coefficients at 1 per cent, 5 per cent and 10 per cent level, respectively.

3.2. The restricted period

Starting our sample by the arrival of the far left coalition (Syriza) in power, in January 25th 2015, we replicate the same testing procedure to the Google queries to assess whether Syriza's presidency (the increased doubts over the debt crisis) strengthened the viability of Bitcoin as alternative currency. Figure 3 confirms the previous results revealing that the high frequency components are the major contributors of Bitcoin and the interest to Grexit.

Figure 3. The hidden characteristics of Bitcoin and the Grexit (restricted period)

BPI



GRK

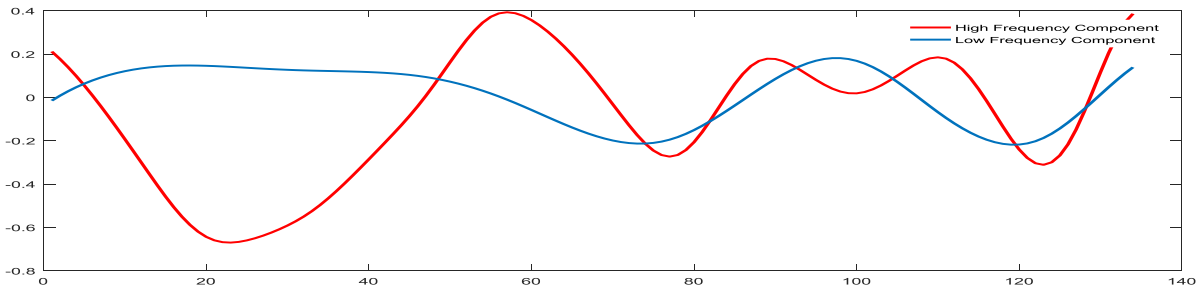


Table 3 summarizes the results of the regression of BPI on GRK in the arrival of Syriza to power. We note that the relationship between BPI and GRK becomes stronger. Not surprisingly, since Syriza's arrival to power, with its radical approach to debt negotiations, doubts have increased as to whether Athens can solve the great uncertainty surrounding the Greek debt crisis.

Table 3. The regression of Bitcoin price on the Grexit (restricted period)

	IMF1	IMF2	IMF3	IMF4	IMF5
C	-1.1352**	-8.2517***	0.830045	-0.00707	0.281522
	(0.0025)	(0.0006)	(0.2482)	(0.9820)	(0.2760)
GRK	0.801342*	0.630909**	0.598754**	0.324009	-0.026138
	(0.0398)	(0.0098)	(0.0015)	(0.2109)	(0.1171)
ETR	0.141563*	0.175537**	0.110998	0.033970	0.021178
	(0.0749)	(0.0091)	(0.8754)	(0.1620)	(0.2743)
TTR	0.119329*	0.127439*	0.159883**	-0.00188	-0.001289
	(0.0670)	(0.0425)	(0.0082)	(0.9202)	(0.9313)
BV	-0.570090	0.027439*	0.043286*	-0.02395	-0.013544
	(0.1130)	(0.0271)	(0.0308)	(0.4256)	(0.5703)
HR	-0.569331	0.008935*	0.902787	-0.02266	0.063511*
	(0.1580)	(0.0461)	(0.2820)	(0.2735)	(0.0405)
SMI	-0.524559	0.487541*	0.379369*	0.03417**	0.1146*
	(0.2938)	(0.0376)	(0.0910)	(0.0015)	(0.0456)
R2	0.80	0.82	0.81	0.78	0.78

Notes: (.): p-values. ***, ** and * in the table denote statistical significant coefficients at 1 per cent, 5 per cent and 10 per cent level, respectively.

4. Conclusions

In recent years, many researchers have tried to address whether Bitcoin can act as a safe haven against global uncertainties by assessing the correlation between changes in Bitcoin price and the returns of other asset classes during times of stress, and showed that investors turn towards Bitcoin to lighten their exposure to losses in highly uncertain periods; Greece is no exception. This paper seeks to address whether Bitcoin can be used to help devastated countries by focusing on the Greek experience.

Using Empirical Mode Decomposition, we find that impact of the uncertainty over Grexit on the interest in Bitcoin is time-varying. Importantly, the growing anxiety over the arrival of the far-left Syriza in power has raised the attention to Bitcoin as a safe haven and a viable new currency. Introducing a parallel local currency to the euro by using safety and digital transparency of Bitcoin seems a seductive idea. It would allow Greece to default on payment delays that threaten the country for years, because of its colossal debt. By adopting Bitcoin, Greece will be able to recover part of its monetary sovereignty and could possibly succeed in undertaking a stimulus policy by creating money. However, this solution would encounter multiple obstacles. Bitcoin is highly volatile, speculative and sensitive to cyber-attacks that can destabilize the whole Bitcoin system (Ciaian et al. 2016; Selmi et al. 2018 a, b; Bouoiyour et al. 2019). Moreover, a main characteristic of Bitcoin is its fixed and capped supply. This means that this money will grow at a steady rate depending to the degree of mining activity. Bitcoin is deflationary; the money supply cannot continue to rise after reaching 21,000,000 Bitcoins, which makes the withdrawal of euro in favor of Bitcoin difficult. Further, due to its complexity in terms of security, privacy and control, it is unknown

for Greeks how far Bitcoin can go. Thus, it would be difficult to convince the Greeks to adopt a new currency whose design seems complicated. No one can predict the precise value and the specific form cryptocurrency will take since the technological development is unpredictable. Under such circumstances, it will be easier for Greeks to return to Drachma rather than running on Bitcoin.

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