



The Future of Bitcoin

Mapping the Global Adoption of World's Largest Cryptocurrency
Through Benefit Analysis

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4/21/2014

Money is a collective agreement. If enough people come to the same agreement, what they agree upon becomes secondary, whether it be farm animals, gold, diamonds, paper, or simply a code. History proves all these cases to be true. Who knows what the future is going suggest to us as money, once we see digital currencies as ordinary?

S.E. SEVER, Writer and Tech Author

THE FUTURE OF BITCOIN

The idea of digital currencies has existed for years. However, despite some effort on the part of programmers, none proved viable. Then, less than a decade ago, Bitcoin exploded into the world of cryptocurrency. Now, Bitcoin has become not only a cultural phenomenon, but a political and economic one as well, holding the fiscal eye of the world captive through its tumultuous course. It has currently been widely discussed and used in many developed countries.

However, my hypothesis is that Bitcoin provides a distinct advantage to populations living in underdeveloped and struggling economies, since it solves the problems of hyperinflation, exchange, counterfeiting, and inaccessibility. This paper also proposes that the three factors that might hinder the widespread adoption of Bitcoin in these struggling economies is lack of infrastructure, unrealized problems with the Bitcoin network itself, and fear of the unknown.

The History of Bitcoin

On Halloween of 2008, an entity named Satoshi Nakamoto¹ distributed a white paper through metzdowd.com, an electronic mailing list that tracks developments in cryptography. Entitled "Bitcoin: A Peer-to-Peer Electronic Cash System," its dense, nine-page summary of an open source, community managed electronic currency system rocked the world of cryptography (Nakamoto, 2009). It wasn't the first online cryptographical payment system. David Chaum had tried as early as 1982 to produce an electronic, blind signature transaction system (Chaum, 1983), but it never gained widespread popularity. Other small attempts periodically attracted a small following, but all were either centrally regulated or lacked the


¹ The identity of Satoshi Nakamoto has yet to be confirmed. Some speculate that, due to the exceptional coding of the first Microsoft Visual Studio implementation of Bitcoin (History of Bitcoin) and the use of third person in the white paper, Nakamoto might be a group of people. Nevertheless, throughout this report, I will assume that Nakamoto is an individual and reference him as such.

security required of a payment system. As Nakamoto states in his white paper, “What is needed is an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party” (Nakamoto, 2009).

The Anatomy of Bitcoin

Nakamoto’s Bitcoin uniquely addressed both decentralization and security. These two aspects begin with the block chain. The block chain is Bitcoin’s public transaction record

Block #293117

Summary		Hashes	
Number Of Transactions	69	Hash	000000000000000920140f36e2fd99a19c86a8087e7562fd8ac9def47de0aee
Output Total	213.48815024 BTC	Previous Block	0000000000000000bfb475986cc7ac7e5765332c2a497e24a68d5fea676e34
Estimated Transaction Volume	16.76571053 BTC	Next Block(s)	0000000000000002ab5ee8ec5680ca6b5a387e6cbc8c23a9a703e78b8e3055a
Transaction Fees	0.01717 BTC	Merkle Root	ed08aa1e57c7cb102065f3aef533241b9fde8bbad378ab6adb0053646610a6fa
Height	293117 (Main Chain)	Network Propagation (Click To View)	
Timestamp	2014-03-29 18:22:13		
Received Time	2014-03-29 18:22:13		
Relayed By	P2Pool		
Difficulty	5,006,860,589.2054		
Bits	419486617		
Size	51.75 KB		

A Bitcoin block, detailing the number of transactions in the block, the difficulty, and the approximate location.

where transactions are documented and verified. Every few minutes, transactions² on the Bitcoin network are compiled into a “block.” This block includes the signature of the previous block and is recorded in the block chain.

Blocks form the basis of Bitcoin creation, and are the central method for ensuring that users cannot double spend their money. As a block is formed, it is broadcast to Bitcoin users called miners who perform a complex algorithmic computation called “hashing” on the block.

² Transactions contain the purchaser ID, recipient ID, and the amount of the transaction. User IDs are a randomly generated series of numbers and letters (for instance, 1Pejb8fQU97JaSCEiD4MJh72UwtBU), and one user can have multiple IDs linking to the same wallet. Thus, Bitcoin transactions are pseudo-anonymous, although transactions can be traced with proper computing equipment and knowledge.

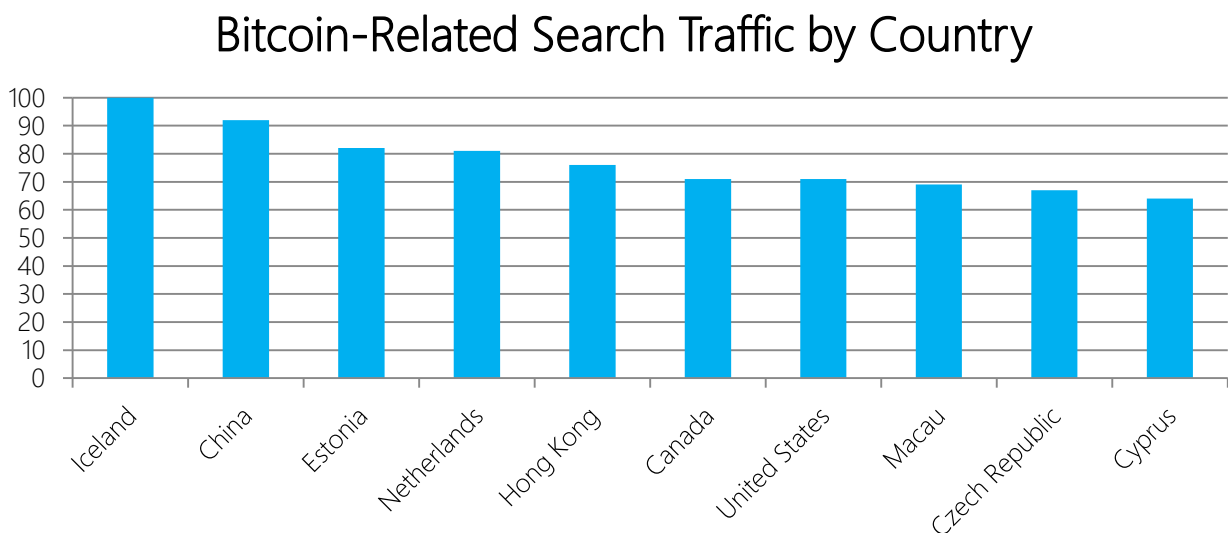
If this computation results a number less than the “difficulty,” a public target number adjusted based on number of miners on the network, that user broadcasts the solution to the network. If the solution is valid, meaning that all transactions in the block are corroborated by other miners’ blocks, the block is passed and a new block is broadcasted. This new block incorporates the old block’s signature, thus creating a seamless record of correct transactions. The award for a correctly solved block is a variable number of new Bitcoin. (Nakamoto, 2009)

Nakamoto’s idea has grown, and now Bitcoin is one of the most influential phenomena of the 21st century, influencing policy debates across the world. To map the future of Bitcoin, however, it is necessary turn our gaze away from the past and look at the current state of Bitcoin usage.

Current Bitcoin Use

Since Bitcoin is relatively new, no metric exists by which one can ascertain an exact rate of adoption, and in all likelihood, due to the complex nature of the Bitcoin network, none ever will. In order to approximate the geographical usage of Bitcoin worldwide, we must look at several metrics.

One initial place to begin to grasp global Bitcoin interest is through search volume. Using

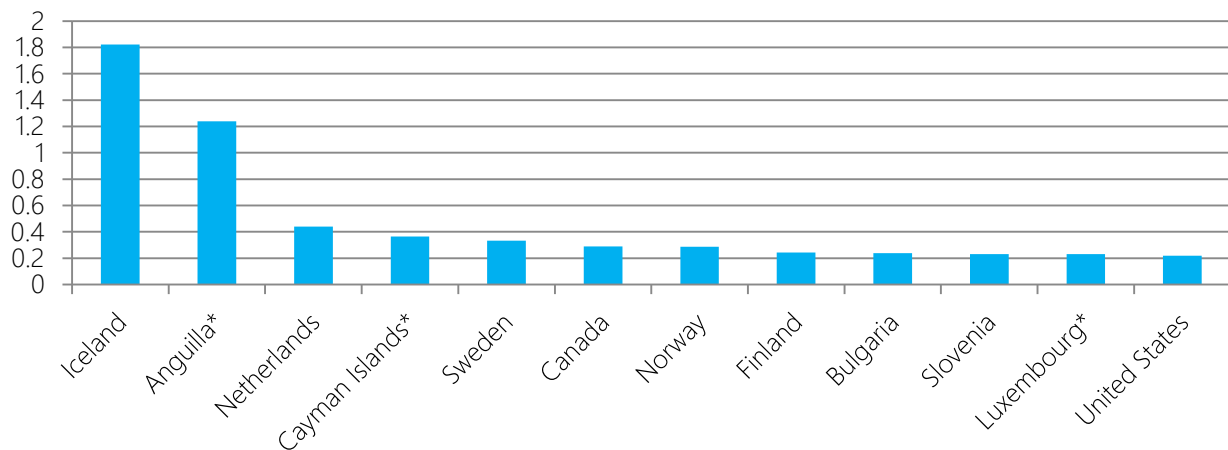


Google Trends data, we can approximate the popularity of Bitcoin by country.

Clearly, Bitcoin is most searched in the Nordic countries and China. Interestingly, only three of the top ten countries – Hong Kong, Canada, and the United States – have explicitly legalized Bitcoin on some level. Recently, Bitcoin’s conflict with Iceland’s exchange law has outlawed Bitcoin transactions, a factor which might contribute to its high search volume for the currency. (Controls suspend trading in Bitcoin, 2013)

Another metric is the number of nodes per country that are mining Bitcoin. This is rather

Bitcoin Mining Node Index



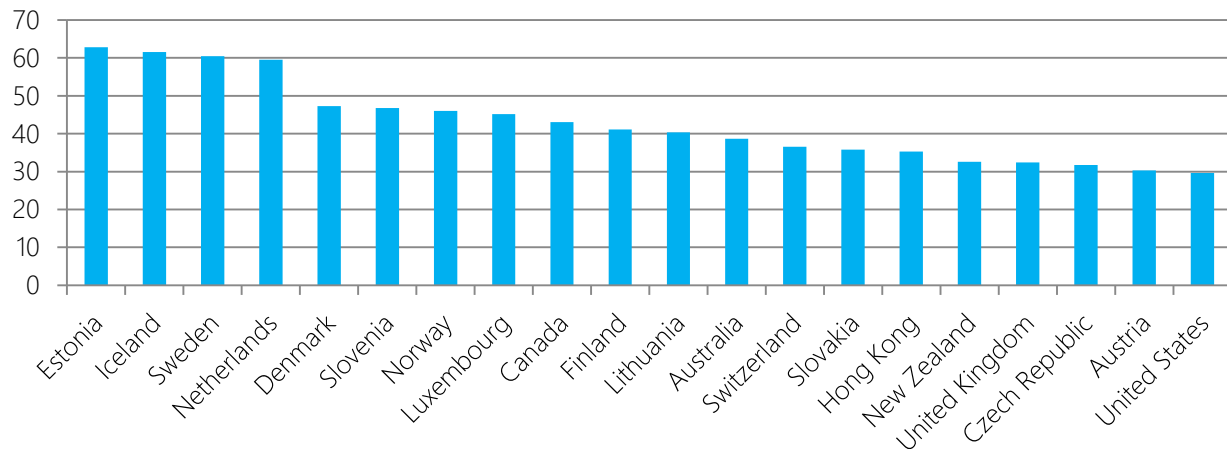
Source: CIA and bitnodes.io

*This country’s population is so small, that its significance is most likely overstated in this graph.

easy to track since the Bitcoin network is open source. In order to gain a standardized measurement of the percentage of Bitcoin mining nodes in a country (Global Bitcoin Nodes Distribution, 2014), I divided the number of nodes in a country by the population (Central Intelligence Agency, 2014), and then used the sum of these percentages to get an index of Bitcoin nodes.

Once again, Iceland is the highest indexed country, which can probably be attributed to the governmental controversy over Bitcoin. That phenomenon does not extend to the other Scandinavian countries, three of which also appear in the top ten.

Bitcoin Software Downloads



One other easily tracked metric for Bitcoin usage is software downloads. I also indexed this data using the same process as the mining node data. Scandinavian countries index high in this category as well, with the United States barely making the top twenty countries.

Based on this data, the current adoption picture of Bitcoin seems to be skewed heavily toward Scandinavian countries, with the US also being a main driver in Bitcoin adoption. The countries are mostly marked by high technological access, relative political and economic stability, and above average gross domestic product.

The Future of Bitcoin

Although currently Bitcoin seems to reside in developed, wealthy, tech savvy cultures, the future adoption of Bitcoin is another matter. By examining the currency's points of difference, we can construct a profile of countries prime for the adoption of Bitcoin. Bitcoin answers the problems of inflation, exchange, fraud prevention, and accessibility.

Inflation

Inflation is an economic phenomenon that is fundamental to fiat currency. It can be defined broadly as "an increase in the average level of prices in the economy" (Schmitt, 2003). There are currently two main theories of why inflation occurs.

Theories

First, in the money supply theory, the government prints money and pumps it into the economy through bonds and direct spending on governmental programs. The quantity theory of money states that $MV = PY$, with M being the monetary supply, V being the velocity of money, P being the price of goods, and Y being output (Montier, 2013). This is what economists call an identity, which means that it must be true (Montier, 2013). Because M has increased, and given a constant velocity and output, prices must rise.

Professor John Harvey of Forbes Magazine (What Actually Causes Inflation, 2011) proposes the second theory, which is that the intentional increase in price of a certain influential good causes inflation. Prices rise because of one of four factors. First, market influencers who are immune or resistant to competitive pressures can raise prices. For instance, the OPEC oil cartel cut the US supply of petroleum during the Yom Kippur War in the 1970s, causing not only oil prices, but prices of anything that relied on petroleum for production. This led to high inflation.

Second, a rise in demand for core goods relative to supply also hikes prices. For instance, a housing boom can lead for a demand in lumber, causing the price of wood to increase. This increase trickles through the economy in higher prices for all related goods.

Third, the asset market can contribute to inflation. When certain commodity futures are trading at high prices, it incentivizes those who produce those commodities to withhold the supply in an effort to increase the price of those commodities.

Finally, supply shock can cause inflation, such as when Katrina devastated the southern US and interrupted the supply of oil. (Harvey, 2011)

Hyperinflation

Inflation, in general, is a natural result of a fiat currency system, and normally poses no major problem to an economy as a whole. However, when the inflation rate reaches at a high enough level, it can quickly become an ugly beast. This is called hyperinflation and can be caused by several phenomena. If we consider the aforementioned quantity of money theory,

$MV = PY$, hyperinflation occurs when the government prints too much money (M), and velocity and output remain constant. This causes price to rise.

Analyst James Montier poses three alternative causes of hyperinflation that build upon Harvey's theory of inflation (*Hyperinflations, Hysteria, and False Memories*, 2013). According to Montier, hyperinflation is caused by three occurrences. First, it can be caused by supply shocks. This normally happens during a war, when a country's output is decimated. This causes prices to skyrocket in order equalize the equation.

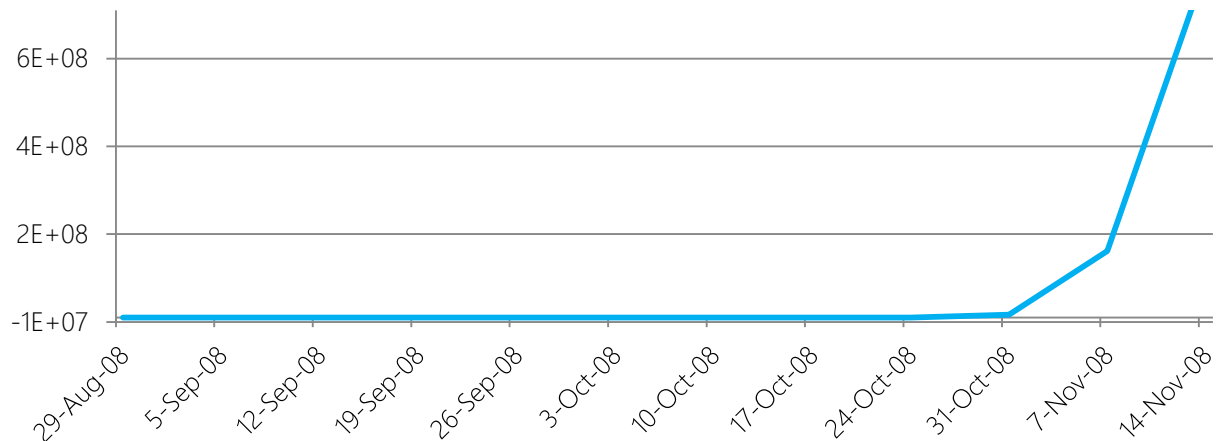
Second, hyperinflation can occur because a country has large debt denominated in a foreign currency. If the debt is unhedged, this exposes the country to gains and losses at the whim of exchange rates, which can be devastating.

Finally, the vicious cycle of transmission mechanism can further hyperinflation. Once hyperinflation has begun to occur, this causes import prices to rise, which in turn leads to higher housing costs. Cost of living increases dramatically with the higher housing costs, causing employees faced with starvation to demand higher wages. These wage hikes, "increasing both home costs and home money incomes, [counteract] the effect of exchange depreciation in stimulating exports and restricting imports" (Montier, 2013). After each wage raise, the exchange rate falls, and after the exchange rate falls, higher wages are called for.

Hyperinflation in History

There have been approximately 56 recorded episodes of hyperinflation in history, and the vast majority of these episodes occurred in the 1990s (Hanke & Krus, *World Hyperinflations*, 2012). One recent instance of hyperinflation occurred in Zimbabwe in early 2007. By mid-November of the next year, inflation had skyrocketed to a monthly rate of 79.6 billion percent (Hanke & Kwok, 2009). One reason for this astounding increase was the redistribution of property and farms from white landowners to inexperienced black farmers (Adams, 2007). The resulting drop in output led to a spike in price, exacerbated by the Reserve Bank of Zimbabwe's aggressive injection of new money into the economy (Hanke & Kwok, 2009). Finally, Zimbabweans refused to use the currency, and hyperinflation stopped.

Zimbabwean Monthly Inflation Rate (%)



Source: Cato Institute

Bitcoin, the Commodity

The nature of Bitcoin makes it largely immune to hyperinflation. First, it is regulated by the community Bitcoin is considered a commodity currency. New “coins” can enter the exchange through mining, but ultimately there is a finite number of Bitcoins that can exist. This causes Bitcoin to appreciate in value. One journal article phrased this advantage in the following way:

Hyperinflations have never occurred when a commodity served as money or when paper money was convertible into a commodity. The curse of hyperinflation has only reared its ugly head when the supply of money had no natural constraints and was governed by a discretionary paper money standard.
(Hanke & Kwok, 2009, p. 353)

Second, Bitcoin is subject to decentralized regulation, which gives it insulation against supply shock and the woes of the money supply theory.

Some worry that this deflation will lead to hoarding of Bitcoin, which would cause both volatility and unavailability of the currency. However, since Bitcoin is an electronic currency, it

can be subdivided in a way that fiat currency cannot³ and the risk of unavailability is low. Volatility is another issue, but the fluidity of electronic currency promises that this will be a negligible issue in the future (Graham, 2014).

By investing in Bitcoin, citizens of countries subject to hyperinflation, whether through supply shocks or unstable monetary policies, can hedge their financial risk.

Exchange

Bitcoin also addresses the problem of exchange rates. Many countries have unstable currencies. This problem is similar to hyperinflation, but instead of the inflation rate going up, these currencies' exchange rates fluctuate wildly. Once again, countries in war-torn areas or in tumultuous regions often are subject to this. These currencies, labeled by economists as junk or volatile currencies, are marked by wildly fluctuating exchange rates.

One example of a volatile currency is Brazil's real. In 2012, finance minister Guido Mantega declared a currency war on the United States, intending to fight back against what he insinuated were unfair "expansionary monetary policies" that caused the real to appreciate (Pearson, 2012). To do this, the Brazilian government extended a six percent transaction tax on overseas loans that would mature in over three years. This transaction tax was designed to cause the Brazilian real to depreciate, making exports cheaper and stimulating the country's economy.

Effects of Exchange Fluctuation

However, instead of having the desired effect, the real exchange rate has since fluctuated dramatically. This fluctuation has caused three asymmetries to develop in the exchange market. First, the psychological factor of loss aversion comes into play, which means that during times of either appreciation or depreciation, the losing side feels the pain of loss more acutely and vocally than the less vocal winning side. This causes further upheaval in fiscal policy.

³ Bitcoin currently supports division to eight decimal places (Thus, currently the smallest amount of Bitcoin is 0.00000001 BTC).

Second, central banks interrupt the natural cycle of currency appreciation. In a perfect world, “nominal appreciation of a currency helps keep inflation low by reducing the cost of imported goods, while nominal depreciation spurs inflation” (Dolan, 2013). In Brazil’s case, when inflation decreased, the central banks rushed to cut interest rates, but delayed in raising them again once inflation began to rise.

Finally, the temptation to take on unhedged foreign currency debt is strongest at the peak of the exchange continuum. This means that any losses incurred are also large. The result is that “Brazil and most of the other emerging markets [now] facing currency woes have opted for floating exchange rates and open capital markets, leaving them little choice but to absorb the pain of devaluation” (Dolan, 2013).

A Constant Currency

While Bitcoin does not offer a complete solution to this issue, it can hedge against currency fluctuations. Individuals living in a country such as Brazil with unpredictable and volatile exchange rates can instead invest their money in Bitcoin. Using Bitcoin as a holding place for their money, they then can either convert their Bitcoin into other, more stable currencies or simply use Bitcoin as their transactional currency. Interest in Bitcoin is already high in countries familiar with this kind of volatility, such as Argentina, Nicaragua, and Venezuela (Southurst, 2014).

Fraud Prevention

The issue of fraud and counterfeit currency is one that is paramount for many countries. For instance, after the Somalian state collapsed in 1991, the country descended into a nightmare of fiscal unrest and anarchy from which it has yet to recover. It eventually became so bad that in 2007, the World Bank estimated “that as much as 80 percent of the currency in circulation is forged, reprinted, or new currencies” (Adams).

The Safety of Bitcoin

The nature of Bitcoin means that Bitcoins cannot be duplicated or otherwise fraudulently manipulated.⁴ In fact, the only way that Bitcoins can be duplicated is if an entity can gain control of over half of the Bitcoin network. If this were to happen, the entity would only be able to double spend their Bitcoins for as long as they maintained control. Due to the collective nature of the Bitcoin network, however, the computing power required to achieve this is massive and, if accomplished, would only be able to last for milliseconds.

Accessibility

The accessibility of Bitcoin is also an advantage. Many countries do not have access to secure banking deposits or even international trade. Bitcoin opens the door for these transactions.

Secure “Banking”

According to the British government, more than 2.5 billion people have no access to a financial institution or insurance provider (Department for International Development, 2014). Most of these people are located in developing countries where corruption is the status quo and a secure financial infrastructure is nonexistent. However, development in mobile phone infrastructure is making mobile banking a possibility for many people. One instance showing the popularity of online banking in developing countries is the phone system M-Pesa, which “processes 80 transactions a second and handles transactions responsible for 31% of the \$33.62 billion GDP of Kenya” (Mims, 2013). Yet over a billion people worldwide own a mobile phone but do not have a bank account (Department for International Development, 2014).

Bitcoin is readily and securely accessible via mobile phone. Users can set up a wallet, deposit and withdraw funds, and check their account through SMS messaging. In essence, Bitcoin can provide the same service as its largest competitor in the developing world, M-

⁴ Bitcoins can be stolen, especially if the account key is kept on a computer accessible by the Internet. However, other reports have detailed ways to keep wallets safe from theft. (McMillan, 2013)

Pesa, “without the risk of server failure, plus it’s cheaper, faster to use and more private” (Hoyle, 2013).



Many African countries such as Kenya have growing access to cell phones, which could lead to Bitcoin adoption. Image courtesy of Agence France-Presse

Trade

Bitcoin also opens up more opportunities for trade. As one tech blog put it, “consumers will be able to buy items from abroad without having to worry about exchange rates, fees and all the other problems associated with purchasing products in a foreign currency” (Hoyle, 2013). This can be a boon particularly for countries with the currency woes mentioned under hyperinflation and exchange rate fluctuation.

Profile of a Country

Through analysis of the benefits of Bitcoin, we can construct a profile of the optimal country primed to adopt Bitcoin. First, this country should be prone to hyperinflation or unstable monetary policies. Second, the country should have a high rate of corruption and counterfeiting. Finally, the country will have a large population of individuals who do not have access to safe financial institutions. In other words, *Bitcoin is the prime currency of countries that are relatively poor, have struggling economies, and are regulated by unstable fiscal policies.*

A Current Example: Cyprus

One country that fits this profile where Bitcoin is already receiving much is Cyprus. During the Cypriote financial crisis of 2012 and 2013, the country's economic landscape collapsed. This was due in part to the US subprime mortgage crisis in 2008, which had rippling effects throughout the world. The Cypriote economy, which primarily relies on tourism and exports, fell in 2009, leading to massive unemployment (Cyprus Unemployment rate, 2013).



The conceptualized lobby of a Neo & Bee branch. Image courtesy of cointelegraph.com.

The banks of Cyprus had also taken on a lot of debt, leading to bad debt ratios. During the Greek financial crisis, the banks were given a haircut of more than fifty percent (Worstell, 2013), which cast doubt on the banks' solvency and led to fears of collapse. This, combined with some other factors, all culminated in a downgrade of Cyprus' credit rating to junk status (Associated Press, 2012) and Cyprus' request of a European Union bailout.

The public's faith in the Cypriote financial system was further shaken when the government proposed a tax on the savings of Cypriote citizens. Although this plan was eventually voted down (Wearden, 2013), any confidence left in the banks was lost.

Seizing this opportunity, a bank began operating this year using Bitcoin as the deposit currency. Called Neo & Bee, it accepts deposits in Euros while giving the option to the customer to convert some or all of their Euros into Bitcoin. Currently, the bank simply facilitates the Bitcoin purchase and storage process. In the future, they plan to offer time locked accounts, in which the depositor agrees to a pre-set purchase price for Bitcoins, and a Euro-pegged account, in which the depositor's balance is calculated in Euros but backed by the corresponding number of Bitcoin (Neo & Bee, 2014).

The launch of this bank has also precipitated a rash of Bitcoin promotion throughout Cyprus, with entities like So Easy Stores, LTV, Telemarketing, and even the University of Nicosia accepting Bitcoin (CyprusMail, 2014). While the bank has not been open long enough to measure the long-term economic impacts of Bitcoin, it will definitely face challenges ahead. Already, the Cypriote government is warning against the use of Bitcoin, and the bank has been embroiled in some legal trouble starting up (CyprusMail, 2014).

Potential Issues

While Bitcoin might be a profitable course for many struggling countries, three main roadblocks stand in the way of its adoption. These include a lack of technological infrastructure, a potentially faulty Bitcoin infrastructure, and fear of new ideas.

Technological Infrastructure

One of the foremost issues that could potentially prohibit the adoption of Bitcoin in struggling economies is that these countries tend to be technologically underdeveloped. Specifically, many of these countries lack reliable access to the Internet through personal computers. While Bitcoin can be accessed through mobile phone, as mentioned earlier, the primary and easiest way to access Bitcoin is by computer.

Countries that fit the Bitcoin adoption profile also often lack the proper financial technology to accept Bitcoin as payment. Bitcoin cannot be tangibly traded, and thus an alternative system, such as check or credit cards, must be in place and be able to readily and

reliably access the Bitcoin network. Without this network, the practicality of Bitcoin will be limited. Bitcoins would have to be converted into local currency before they could be used, which is not conducive to frequent, casual spending.

Bitcoin Infrastructure

Another issue hindering Bitcoin adoption is that concerns have recently been raised over the actual infrastructure of Bitcoin itself. In February of this year, a flaw in the Bitcoin code was exposed which allowed users to fraudulently report that successful transactions had not been completed, and thus hemorrhage money from Bitcoin financial entities. This coding flaw caused several prominent Bitcoin exchanges, such as Mt. Gox and Bitstamp, to lose millions in fraudulently withdrawn coins (The Economist, 2014). This code was quickly patched⁵, but faith in Bitcoin had been shaken. This instability in public trust of Bitcoin could slow the rate of its adoption in prime countries.


Fear

Finally, fear of the unknown could prevent some countries from adopting Bitcoin as currency. The nature of cryptocurrency is itself very cryptic. To a mind untrained in computer programming and technological jargon, the idea that a piece of code could hold monetary value is somewhat of a stretch. Even Benjamin Lawsky, superintendent of the New York State Department of Financial Services and a key influencer in Bitcoin legislature, stated that Bitcoin is “a very steep learning curve” (Hochstein, 2014). Reticence to adopt Bitcoin is all the more likely in poor and struggling countries, since technological education is often limited in these environments.

Conclusion

Despite these drawbacks, Bitcoin still remains a tour-de-force in modern digital currency, as well as an agent of economic change. It has the potential to do much good for countries

⁵ Some argue that this code had been patched in 2011, years before any damage had occurred, and that the Bitcoin exchanges affected by the flaw had neglected to implement the patch in a timely fashion (Hruska, 2014).

with tumultuous and unfortunate economic history. By offering an alternative currency for struggling countries, it opens the door for economic transformation to occur, and gives individual citizens more options in managing their own finances. Whether or not Bitcoin itself accomplishes these lofty transformations, cryptocurrency has entered the financial stage to stay and has changed the global economic landscape forever. 

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