Global Virtual Currency – Brief Overview

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Virtual currencies are becoming increasingly used for financial transactions worldwide. Bitcoin is the most prominent virtual currency that uses digital currency units and operates directly from user to user without involvement by bank or other institution. Price of Bitcoin started at under ten cents in 2010 and currently trades at above nine hundred dollars per Bitcoin unit. Some virtual currencies are convertible to real money and others are not. Government responses varied from ban to application of current or new laws. Virtual currency will grow due to emergence of newer technologies and applications, and the rise in potential benefits.

INTRODUCTION

Advances in encryption and network technologies are introducing transformational changes in the valuation, exchange and accounting of economic assets and commercial transactions, and the recent emergence of virtual currency (VC), which makes possible exchange of economic value between parties without the involvement of traditional clearing house or bank, is a notable example of transformation. VC does not fit the legal concept of real currency because real currency (RC) banknotes and coins are issued by sovereign government whereas VC is not issued nor protected by government. Nor does it measure up to the economic role of real money due to the sharp volatility of its value which undermines its role as a medium for money transactions and purposes such as starting a savings plan for future financial security. VC is issued and exchanged without the backing of sovereign government, and VC-related account ledgers maintain complete and secure records of all transactions without the need for a central registry. The development holds promise for some benefits but also poses serious risks. VC is new and growing rapidly and is constantly open to newer technologies and innovations from interested participants in its global open source system, all of which make the future of VC not easy to predict, long term or short. So, an appropriate question to start with is: What is virtual currency?

VIRTUAL CURRENCY AND HOW IT WORKS

Given the newness of the phenomenon and its rapid change, suggesting a universal but encompassing definition of VC is a challenge. That being said though, core features or dimensions can be defined: (1) VC is a form of *digital currency* (DC) which is digital representation and measurement of economic value for an object or transaction; (2) it is issued by non-government party and remitted for the exclusive use by another private party; (3) it is denominated in units of account of its own system that may or may not be exchangeable to real currency; and, (4) it is used as a *medium* of exchange similar to RC but does not have legal tender status in any jurisdiction in the world. It is not illegal, but it also is not *protected* by government. Now, as for the basic or generic concept of digital currency mentioned in (1) above, it

covers a wide array of DCs ranging from simple "promises" or IOUs such as digital 5% coupon issued by a retailer and retrieved as digital code on mobile device, to digital currencies backed by tangible economic assets such as gold or national currency, to the more sophisticated and increasingly popular "cryptocurrency", the algorithms used to exchange economic value between parties using principle of cryptography that are believed to be secure and unbreakable. The most famous cryptocurrency at the present is Bitcoin, the current leader in VC industry as measured by its market value, volume, and growing acceptance worldwide, and the symbol for which is similar to the dollar sign $ with B in place of S as shown in the following table. Table 1 identifies types of digital currency ranging from the simple digital payment system such as Pay Pal, to the cryptographic cryptocurrency, their units of denomination, and key features or examples.

TABLE 1
DIGITAL CURRENCIES

Type of Currency	Denomination	Key Feature
Digital currency (not virtual currency)	Denominated in real currency, e.g. US Dollar	Digital payment mechanism, e.g. e-money, Pay Pal, digital bank wallet
Non-convertible VC	Own units. Non-convertible to RC or other VC	Use only nonconvertible "coins"
Convertible VC	Own units. Convertible to RC, goods, and more	Centralized or decentralized VC system
Cryptocurrency	Basic Bitcoin unit, BTC, value depends on prevailing exchange rate, MilliBitoin mBTC is 0.001 BTC, MicroBTC is 0.000001 BTC, *satoshi* (smallest unit) is 0.00000001 BTC.	Use only cryptography to validate value and transaction.
Sources: https://en.bitcoin.it and IMF 2016,		

To further explain the nature and characteristics of VC in general and Bitcoin in particular, it is compared to US home currency and a foreign currency (as in the case of Euro used in the US) on the dimensions of intrinsic value, legal tender, medium of exchange, structure, supply source, cost of production, risk of inflation, and the possibility of the issuer being the lender of last resort. A summary of these issues is presented in Table 2.

VC can be non-convertible to RC and operates within a closed system with restrictions on transactions outside its virtual online domain, or convertible that allows exchange to RC, and can be used for purchases and commercial transactions in real economy especially that a growing number of businesses have started accepting VC especially Bitcoin. Not unexpectedly, convertible VC, Bitcoin in particular, does more business with real economy than non-convertible closed VC.

VC system must have organization structure to oversee issuance and redemption of payments, monitor circulation, and control transaction settlements, and this structure can either be decentralized or centralized A decentralized system, most notably Bitcoin, operates free of a centralized administration, where transactions are done electronically between participating Bitcoin account holders. The system operates on a myriad of software protocols, such as Bitcoin's SHA-256 which is cryptographic hash functions, to initiate and complete remittances and verify accuracy of transactions, and ultimately record them in a virtual public ledger that contains all accounts. In Bitcoin, the work of verifying transactions and recording them in the ledger is done by a global network of Bitcoin participant account holders referred to as "miners" because they are rewarded by "mining" for newly created bitcoins, and who are generally speaking equipped with special computers (such as ASIC machines) referred to as nodes, and the complicated work of transaction verification and recording they do is referred to as "mining" (Brito

and Castillo, 2013). The decentralized cryptocurrency system has the interesting and important feature of pseudonymity whereby the participants in the system, senders and receivers, are identified only by their virtual "addresses" made up of bits and bytes, which they create when they sign up for Bitcoin and obtain a pair of identification codes known as keys, a private key generated by digital signature algorithm, that works like password and is known only to the account holder, and a public key that is referred to as "address" because it is the address (account) to which the bitcoin remittance is sent. Both keys are <u>unidirectional</u> in design and cannot be traced back to the participants' real identity. This level of pseudonymity is a famous feature of Bitcoin, perhaps the most famous and attractive feature.

TABLE 2
COMPARISON OF CURRENCY CHARACTERISTICSs

Characteristic	Bitcoin VC	US Dollar	Euro
Intrinsic value	None	None	None
Legal tender	No	Yes	Not in the US
Medium of exchange	Small, among participants	Yes	Limited in the US
Used to store value	Limited and risky	Yes	Yes, subject to exchange
Structure	Decentralized	Monopoly	Monopoly
Supply source	Private	Public	Public/foreign
Cost of production	Computer utility power	Low	Low
Risk of inflation	No	Yes	Yes
Issuer is lender of last resort	No	Yes	Yes
Source: Redish (1993), IMF (2016), Bordo (1981).			

An interesting and rather transformational feature of decentralized cryptocurrency, CC, is the accounting system alluded to earlier. While participants in cryptocurrency are anonymous, their transactions are not. CC transactions are recorded in a virtual ledger referred to as *Blockchain,* and is transparent to all participants worldwide without revealing participant identity. (If reader wishes to see a live blockchain board with virtual transactions posted almost every second, the following Website is useful: https://blockchain.info.) Miners, who in effect perform mathematically challenging transaction recording and auditing, do the important task of collecting new transactions, grouping them into newly created "blocks" of transactions, and using cryptographic hash to connect (chain) them to previous blocks. That is why the ledger is called blockchain – it is a chain of blocks of verified transactions. Miners add the new blocks to their copy of the chain, and broadcast the updated ledger to the global Bitcoin network for verification. With all nodes maintaining copies of the same ledger, they provide independent universal verification of the millions of transactions and an updated registry of ownership of all bitcoins. This is how Bitcoin system operates – decentralized, peer-to-peer, maintained and validated by its worldwide participants without a centralized monitoring and intervening authority. An interesting system that observers believe may hold promise beyond VC.

A centralized VC system on the other hand has a centralized repository and administrator who performs the myriad of originating, controlling and recording transactions described above except for the major difference that the work in here is done by a central administrator, quite often a commercial company such as the famous Liberty Reserve Company that at one time processed $8 billion worth of VC transactions on behalf of 5.5 million users/account holders around the globe.

With regard to the source of VC, participants purchase them with real currency through the services of a VC exchanger, a trade platform where buyers and sellers offer and bid for VCs, from other VC holders, or, more recently and in the case of Bitcoin, from ATM-like stations through which one may sign up for an account, create the virtual pair of identity keys, the private and the public *address,* and purchase

BTCs. Holders of VCs usually store them in what is known as "VC wallet", and their account balances are recorded in the blockchain.

HISTORY

VC is not the first privately issued currency in a decentralized system that does not have legal tender status. Historically, central banks in major economies started as being private financial institutions issuing currencies that did not have legal tender nor did the institutions have monopoly power as the exclusive issuer of currency. Table 3 provides examples of major economies and the origins of their central bank powers. And in the United States, many private banks issued notes that did not have legal tender status during the US Greenback era of the Civil War and that lasted until the central bank was founded in 1913. Public centralized systems became necessary to limit the likelihood of over-supply of currency and related inflation.

TABLE 3
ORIGINS OF CENTRAL BANK POWERS

Country	Date Founded	Monopoly over Note Issue	Notes Made Legal Tender	Government Ownership
France	1800	1848	1878	1945
Germany	1875	1875	1909	1948
England	1694	1844	1833	1946
United States	1913	1913	1933	N/A
Source: Redish (1993).				

Some researchers continue to advocate *laissez-faire* monetary system and propose theoretical arguments on the feasibility of privately issued currency under conditions of competition (Selgin and White, 1994). The famous Milton Friedman argued that regulated system may come under question in times of crises and floating rates of money may be considered (Friedman and Schwartz, 1986) and in 1999 he is reported to have made explicit prediction that *the one thing that is missing but that will soon be developed is a reliable e-cash, a method whereby on the Internet you can transfer funds from A to B, without A knowing B or B knowing A* (Brito and Castillo, 2013, vii). It has been argued that the creation and emergence of Bitcoin coincided with the collapse of the global commercial financial system in 2008 and 2009. It was in November 2008 that Bitcoin "white paper" was published on the Internet under the virtual or pseudo name Satoshi Nakamoto, whose identity has been claimed but never adequately verified (Gold and Vigna, 2016). In 2009, bitcoin network came into existence with the issuance of the first BTC, and the first purchase made was two pizzas from Papa John's on May 22, 2010 for the value of 10,000 BTC which at the time, and at the prevailing exchange rate were worth about $25. Those prices, though, are long gone. In the evolution of this young currency, its exchange rate rose and fluctuated dramatically. BTC value in dollars went from $0.08 in July 2010 to $14.31 in 2011, $6.79 in 2012, $74.56 in 2013, $629.91 in 2014, $269.64 in 2015, $754.68 in June 2016, and around $918.20 on January 27, 2017 (BPI, 2017), as illustrated in Figure 1. As of January 2017, Bitcoin market capitalization value is estimated at $14.942 billion and transactions per hour are reported to be 11,423 exchanging an estimated 84,471 bitcoins at the current market price. (Bitcoin Charts, 2017).

FIGURE 1
DOLLAR BITCOIN EXCHANGE RATE - US $ TO A BITCOIN
(As of January 27, 2017)
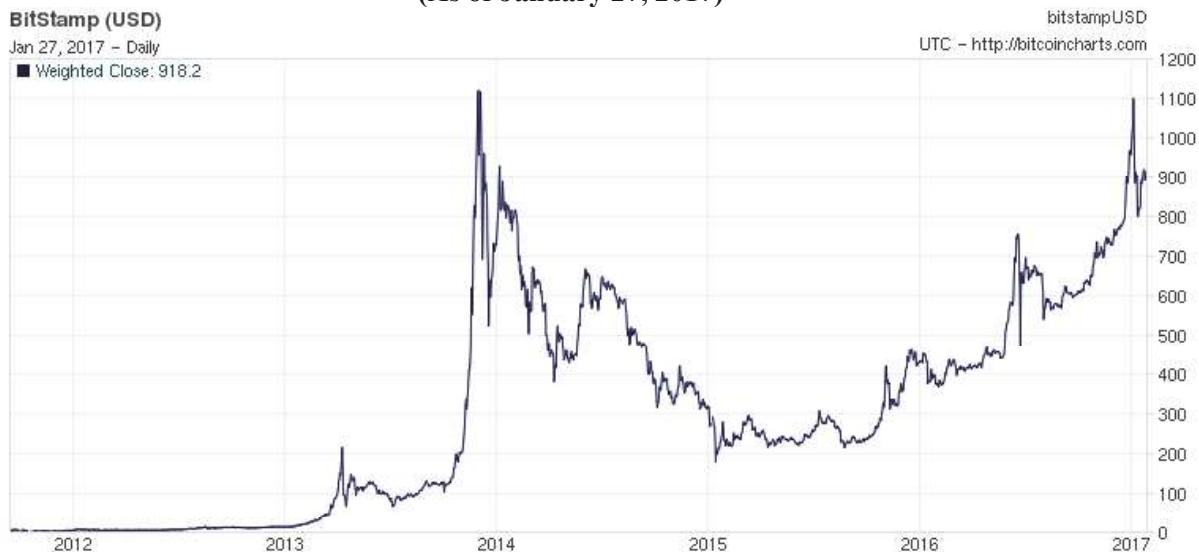
(Source: BPI, 2017)
http://bitcoincharts.com accessed January 28, 2017

BENEFITS AND RISK

VC is new but has already created unprecedented benefits such as (a) expedited transactions that take minutes instead of days; (b) record keeping system that is accurate, secure, and monitored by global networks of account-holders free of central authority; (c) lower cost of international financial transactions especially remittances that on average cost 7 percent through the bank but only 1 percent through Bitcoin; (d) low-cost alternative to expensive credit card transactions that would be especially beneficial to small and medium size companies; and, (e) the potential that ledger technology may be extendable to non-VC transactions such as land and gold. Another big benefit of VC and especially Bitcoin is expanding the reach of virtual finance to people in developing countries who currently may not have access to traditional banking services. It is estimated that 64 percent of the population in developing countries lack access to the services of commercial financial institutions who shun poor rural areas due to high costs of extending banking services to those areas. People in many developing countries have turned to mobile banking for their financial needs, which contributed to the growth of electronic payment services such as M-Pesa used in Kenya, Tanzania, Afghanistan and others (Fong, 2013). Such mobile banking services can be augmented considerably by using Bitcoin VC system. The benefits and future potentials have encouraged a growing number of companies to accept Bitcoin. In February 2015, the number of businesses accepting BTC surpassed 100,000 (Cuthbertson, 2015). The list includes famous household names like Dell, Amazon, Target, CVS, Subway, Victoria Secret, Pay Pal, Expedia, Zappos, Sears, Kmart, Home Depot, Gap, Whole Foods, and even a political party – The Libertarian Party! The list continues to grow among all companies, small and large, including Fortune 500 (Chokun, 2016). But the absence of regulation has left unaddressed the risks that VC may pose, especially the risks posed by cryptocurrency with its solid pseudonymity. The risks range from concern about illegal money laundering, illicit use of VC to support global crime, tax evasion, and unsupervised capital traffic. To complicate matters, VC has been defined as currency, commodity, property, or payment system, and these different classifications produce diverse regulatory treatment. For example, the IRS has classified VC as "property" for tax purposes, whereas Treasure Department classified it as "value" for purposes of anti-crime anti-terrorism regulation.

VC systems have attributes that could entice illicit users for purposes of money laundering and other illegal purposes. The reasons why VC system has such vulnerability include:

1. Users may remain pseudonymous. This is a huge attraction to the system.
2. Being decentralized, the system does not have an administrator to keep information on users and report questionable activity to government. Not only are users pseudonymous, they are unreported!
3. The system is rather easy to use, and the fees are either voluntary or minimal.
4. It is global and can be accessed wherever there is an Internet connection.
5. The system has been substantially, though not fully, safe against hackers or intrusions.
6. Transactions are unidirectional and irrevocable.

These attributes may appeal to parties tempted to use the system for illicit purposes especially when coupled with the fact that *anti-money laundering* (AML) and *counter terrorist financing* (CFT) laws in different jurisdictions across the globe are weak and have varying degrees of rigor, consistency and enforcement. If financial institution that deal with VC globally do not have in place universally agreed to and consistent AML/CFT measures, the system may very well attract illicit users (Treasury, 2013). The possibility has actually happened few times. One of the more famous cases is the company known as Liberty Reserve, mentioned earlier, which used its centralized VC to facilitate $6 billion money laundering used by criminal organizations engaged in credit card fraud, identity theft, investment fraud and the like, and to allow cybercriminals to conceal and move their illegal proceeds anonymously. This company operated from 2005 until 2013 when US government shut it down (Hong, 2016). Another risk due to pseudonymity is vulnerability to hacking which, to the surprise of many, actually occurred in August 2016 when the Hong Kong based exchange Bitfinex was hacked and lost 120,000 bitcoins (Vigna, 2016).

A key factor that has burdened the global effort to combat VC risk is the multitude of policies and regulations among countries of the world as shown in Table 4. Some countries went as far as banning VC, others addressed some of the immediate risks such as AML/CFT. A number of countries have yet to adopt any formal position on VC.

TABLE 4
COUNTRY RESPONSES TO VC RISK

Country	AML/CFT	Tax Treatment	Consumer Warnings	Financial Sector	Ban on Issuance/use
Argentina	Warning on ML/TF risk		Consumer warning	Warning on reporting	
Bolivia					Yes
Canada	Amend existing regulations	Clarified tax treatment	Consumer advisory		
China				Ban	
France	Application of current laws	Clarified tax treatment	Warning		
Germany	Application of current laws				
Italy			Warning	Warning	
Japan	Plan new rules		Warning	Plan new rules	
Russia	Application of current laws		Warning		Yes – draft law
U.K.	Application of current laws	Clarified tax treatment			
U.S.	Application of current laws	Clarified tax treatment	Warning	State licensing requirements	
Source: Various public sources, and IMF (2016).					

OUTLOOK AND RECOMMENDATIONS

Virtual currency is a relatively recent phenomenon in global finance, and as such, its identity, structure and function are continually evolving, but in the meanwhile, it is increasingly recognized as bona fide medium for global finance with immense potential. Bitcoin is the largest and most common VC, and while its initial introduction in 2009 was met with skepticism, hardly a week goes by these days that a large institution does not announce interest in Bitcoin whether it is UBS that says it could lead to massive simplification of banking, or Bank of England who believes it will someday have far-reaching implications, or Nasdaq who is testing bitcoin technology for use on its stock exchange (Mims, 2015). Indeed, in 2009, total transactions were barely above 30,000 *a year*, and have now grown to 11,423 *per hour*, and the growth continued as shown in Figure 2, and will likely continue with the support by big name institutions such as Microsoft, endorsement by governments like Mexico and Britain, and the growing availability of Bitcoin now that special ATMs are becoming increasingly available ever since the first Bitcoin ATM was installed in Vancouver, Canada on October 29, 2013 (Liljas, 2013). The blockchain technology also holds promise and may one day provide digital alternative to a wide range of record keeping systems as attested to by senior VP at IBM stating that *the number of places that a distributed ledger can be used could become almost limitless* (McMillan, 2016).

FIGURE 2
GROWTH IN ANNUAL BITCOIN TRANSACTIONS
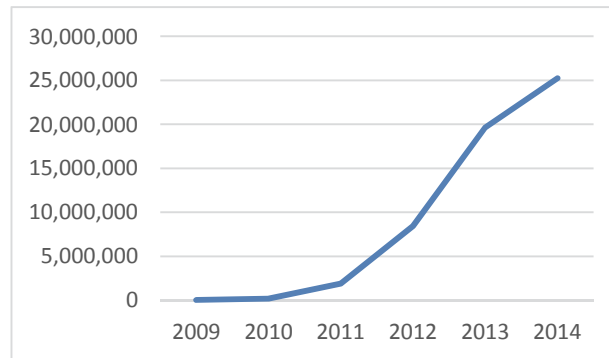
Published Bitcoin cumulative transaction data is limited to January 2015.
Source: http://www.coincadence.com accessed January 27, 2017

How big will Bitcoin become? It had been proclaimed dead 89 times already, labeled a Ponzi scheme and a failed experiment. But beyond the rhetoric, observers have compared Bitcoin to another technology: The World Wide Web (Donnelly, 2016). Bitcoin is only seven years old and its base layer protocol is stable and performing to capacity, but like all new technologies, it is experiencing limitations such as the slow pace of operation manifested by the limited ability to handle only three transactions per second (TPS). Second layer infrastructure is needed and fortunately efforts are under way by dedicated companies like Bloq, BitGo, and Coinbase to build newer technology to open new frontiers and fulfill VC potential to become accessible to millions of people in the markets lacking global banking services. Experiments are also underway to introduce Bitcoin-like *digital gold,* which surprisingly, is already receiving acceptance and some trading activity in Argentina, India and Brazil (Donnelly, 2016). These indicators, and many more, suggest that Bitcoin is here to stay, and judging by its young but remarkable history, will continue to grow.

The eminent growth of Bitcoin and the potential entry into new spheres of global economy, is putting pressure on governments to develop regulatory policies to allow and encourage useful purposes and protect against risk. There is not one path for VC public policy but key principles and guidelines may be worth considering. First, policy should protect against risk but should also not stifle the innovation with its remarkable potential. Outright ban is wrong but selective strategic targeting is more reasonable. It is suggested that regulating VC intermediaries such as exchangers or VC wallet providers, as the State of New York has recently done, is better than total intervention. Second, policy should address market conduct to protect against illicit users. A good example is AML/CFT discussed earlier which has been proven effective in the United States to protect against illegal use without intervening in the core virtual technology. Third, government has to monitor growth of VC systems into new spheres of the economy and society as in cryptocurrency technology used to trade precious metals anonymously. And finally, international collaboration and coordination is essential to strengthen international understanding of VC and coordinate policies affecting the above-mentioned priorities. Developments in global digital finance are huge, and while they produce infinite opportunities, they also produce threats. The rise of digital identity theft and fraud has affected 15.4 million consumers in the United States in 2016, resulting in $16 billion total losses on top of $112 billion in the previous six years (Pascual, Marchini & Miller, 2016). Finance and technology industries collaborate to find remedies as in the recent experiment to use *tokenization* technology which would give a single unique code for each business transaction, somewhat similar to the *concept* of cryptocurrency (Andiriotis & Rudegeair, 2017). The core technology of Bitcoin may hold promise to address challenges posed by the new world of digital finance.

REFERENCES

Andriotis, A.M. & Rudegeair, P. (2017). Credit card fraud keeps rising. *Wall Street Journal,* February 2, B6.

Bitcoin Charts. (2017). https://bitcoincharts.com/bitcoin/ accessed January 28, 2017.

Bordo, M. D. (1981). The classical gold standard: Some lessons for today. *Federal Reserve Bank of St. Louis Review,* (May), 2-17.

Brito, J. & Castillo, A. (2013). *Bitcoin: A primer for policymakers.* Mercatus Center, George Mason University, www.mercatus.org accessed April 18, 2016.

BPI. (2017). BPI value data. www.coindesk.com accessed January 27, 2017.

Chokun, J. (2016).*Who accepts Bitcoins as payment? List of companies, stores, shops.* http://www.bitcoinvalues.net/who-accepts-bitcoins-payment-companies-stores-take-bitcoins.html, accessed June 11, 2016.

Cuthbertson, A. (2015). Bitcoin now accepted by 100,000 merchants worldwide. *International Business Times,* www.ibtimes.com accessed April 19, 2016.

Donnelly, J. (2016). Here is what the future of bitcoin looks like – and it's bright. www.venturebeat.com February 14, accessed April 25, 2016.

Friedman, M. & Schwartz, A.J. (1986). Has government any role in money? *Journal of Monetary Economics,* 17, (1), 37-62.

Fong, J. (2013). How Bitcoin could help the world's poorest people. *PolicyMic,* May. http://mic.com/articles/41561/bitcoin-price-2013-how-bitcoin-could-help-the-world-s-poorest-people accessed July 6, 2016.

Gold, R. & Vigna, P. (2016). Craig Wright claims he is Bitcoin inventor "Satoshi Nakamoto". *Wall Street Journal,* May 2, *www.wsj.com* accessed June 16, 2016.

Hong, N. (2016). Liberty Reserve head sentenced to 20 years in prison. *Wall Street Journal,* May 6. www.wsj.com, accessed June 4, 2016.

IMF. (2016). Virtual currencies and beyond: Initial considerations. *IMF Staff Discussion Note,* January 2016. *

Liljas, P. (2013). World's first Bitcoin ATM launched in Canada. *Time,* www.business.time.com accessed May 16, 2016.

McMillan, R. (2016). IBM bets on Bitcoin ledger. *Wall Street Journal,* February 16, B1-B2.

Mims, C. (2015). How future Bitcoin can prevent a future Greece. *Wall Street Journal,* July 13, B1.

Pascual, A., Marchini, K. & Miller, S. (2016). 2016 identify fraud: Fraud hits an inflection point. *Javelin Strategy*, February 2. www.javellinstrategy.com accessed February 3, 2017.

Redish, A. (1993). Anchors aweigh: The transition from commodity money to fiat money in Western economies. *Canadian Journal of Economics*, 26, (4), 777-795.

Selgin, G. & White, L. (1994). How would the invisible hand handle money? *Journal of Economic Literature,* 32, (4), 1718-1749.

Treasury. (2013). *Statement of Jennifer Shasky Calvery, Director Financial Crimes Enforcement Network of the United States Department of Treasury.* United States Senate Committee on Banking, Housing and Urban Affairs, Subcommittee on National Security and International Trade and Finance, November 19. www.fincen.gov, retrieved June 1, 2016.

Vigna, P. (2016). Gospel of Bitcoin faces test of faith. *Wall Street Journal,* August 6, B1, B5.

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