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The Inevitable Sociality of Money: the Primacy of Practical Affirmation over Conceptual Consensus in the Construction of Bitcoin's Value

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Abstract
Bitcoin has gone from being the monetary project of a small online group to a globally exchanged money with a market valuation of several thousand dollars (USD) per unit. It has achieved this in spite of the irreconcilability between its material basis and the economic theories which inspired its creation. This article investigates how this was possible by applying a computationally grounded (Nelson 2017) approach to 100,000s of messages from Bitcoin's two main online communities. Through this analysis, it identifies continuing divergence in participants' understandings of why Bitcoin possesses value and an emergent focus on the social problem of adoption. In demonstrating how this confrontation ultimately led to the promotion of activities that affirmed Bitcoin's value in practice, this article clarifies the primacy of shared meaning in the form of practical affirmations of worth, rather than conceptual understandings of its origins, in these communities' "bootstrapping" of its initial economic value.

Keywords: Bitcoin, cryptocurrency, money, valuation, computational grounded theory

JEL Classification: Z1 Cultural Economics; Economic Sociology; Economic Anthropology

1. Introduction

Karl Menger's theorization of the origins of money (1892) begins with the "mysterious" fact that "every economic unit in a nation should be ready to exchange his goods for little metal disks apparently useless as such, or for documents representing the latter." (p. 239). Over a century later, the same sentiment could be applied to the "useless" bits of digital information underlying new cryptocurrencies such as Bitcoin. Given that Bitcoin has at no point been backed by anything considered to have intrinsic worth, Menger's proposed solution of money's value originating from its association with highly "saleable" commodities that were inherently valued by many individuals (e.g. precious metals) does not seem to hold. The failure of such a widely accepted model to account for the complexities of this modern monetary project is interesting. A greater degree of sociological significance is granted, however, when one considers that it was the same body of Austrian economic theory to which Menger's account of money is considered foundational motivated the various online communities of "Techno-Libertarians" and "Anarcho-Capitalists" to first pursue the development of a stateless "digital gold" (Dodd 2017, 2018; Golumbia 2016; Popper 2015) **-** a collective effort which ultimately resulted in the invention of Bitcoin (Nakamoto n.d.). One might expect this incongruity between the founding theory and material facts of cryptocurrency would have posed a fundamental barrier to Bitcoin's development. Nonetheless, in the decade since it began, this monetary project has succeeded to an extent that a single bitcoin is currently valued in the arena of several thousand dollars (USD)[1] and its usage has spread across the globe. How was this achieved?

This article offers a partial empirical answer to this question by applying a "computationally grounded theory" (Nelson 2017) approach to Bitcoin's transition from a highly performative (Callon 1998; Mackenzie 2003, 2006), utopian (Dodd 2017, 2018) project into a

community undertaking centered on the problem of spreading its adoption and affirming its value in practice. This work takes as its primary object of study text generated by two online communities central to Bitcoin's initial development, BitcoinTalk.org and r/Bitcoin. Using a combination of both traditional and automated content analysis of the 100,000s of messages produced by these core communities through June 2015, this work offers an original empirical analysis of the sociological processes by which Bitcoin secured its initial economic value and considers the implications thereof for the sociology of money (Bandelj, Wherry, and Zelizer 2017; Carruthers and Babb 1996; Carruthers and Espeland 1998; Dodd 2014; Fine and Lapavitsas 2000; Ingham 2004b; Orléan 2014; Polillo 2011; Zelizer 1994, 2000).

Of central interest will be a finding that rather than converging on a shared conceptual understanding of what gave Bitcoin worth, the early years of its development were actually characterized by an increasing diversification of such accounts of its value. This analysis will also show, however, that even with this lack of conceptual convergence on *why* Bitcoin had value, individuals' participation in these forums ultimately helped to solidify the shared understanding *that* Bitcoin was valuable in practice. In constructing this account of how Bitcoin's economic value was thusly "bootstrapped" (Barnes 1983; Shaw 2019) by the community surrounding it in a manner directly at odds with its founding ideology (Dodd 2018; Swartz 2018), this work will propose that even in the case of general, homogenized monies (Dodd 2014; Polanyi 1957; Zelizer 2010), a money's economic value can arise from nothing more than individuals' collective coordination upon a reliable, self-fulfilling (Merton 1948) expectation that others also value the money – regardless of whether they ever come to an agreement on the justification for that expectation. By foregrounding the process by which this collective assignment (Searle 2005) of Bitcoin to the status of valuable monetary object was

achieved within these communities, this work will endeavor to refine our understanding of the role of shared meaning in the constitution of new monies by asserting the primacy of practical affirmations of worth over explicit conceptual convergence during the initial social construction of a monies' economic value.

2. Contextualizing Bitcoin

Bitcoin originated in the midst of the Great Recession, out of an online, geographically dispersed collection of self-proclaimed Techno-Libertarians, Anarcho-Capitalists, and Cypherpunks (Dodd 2014, 2017, 2018; Golumbia 2016; Hayes 2019; Popper 2015; Swartz 2018). Though participants' ideologies varied along several key dimensions (Hayes 2019; Swartz 2018), they shared a common orientation toward protecting individual freedom from the coercive influence of the state and a deep mistrust of centralized institutions. Austrian and right-wing economic viewpoints also prevailed within the group (Dodd 2017, 2018; Golumbia 2016), including frequent expressions of antipathy toward central banking systems and the Federal Reserve and a pronounced preoccupation with the dynamics of inflation.

In other contexts, this fixation on governments' power over the money supply and the prioritization of protecting free markets from government intervention has given rise to groups advocating for abolishment of the Federal Reserve and a return to the gold standard. The transposition of this set of views into the communities responsible for Bitcoin's creation has led to the development of a new form of "digital metallism" s(Maurer, Nelms, and Swartz 2013; Swartz 2018)**.** This digital metallism is defined by its endeavor to emulate "practical metallism" (Ingham 2004a) in establishing a politically and socially independent basis for money, not through the physical distribution of a real-world commodity (e.g. precious metals), but through

the development of a system of algorithmic verification that is capable of creating secure, reliable records of economic exchange without requiring any trusted third party (e.g. a government or bank) to maintain them and can be designed to place a firm cap on its total money supply[2]. The shared preoccupation with developing a digital analog to metal backed monetary systems preceded the creation of cryptocurrency by over a decade and can be seen in a number of early proposals and discussions within the community (e.g. Szabo 2008 ; see (Hayes 2019) for a more in-depth account).

The development of an electronic record of exchange that was both decentralized and secured from malicious manipulation was a difficult technical problem. In late 2008, however, an individual or group operating under the pseudonym of "Satoshi Nakamoto" proposed a viable solution to the problem in a white paper outlining a revolutionary new blockchain design (Nakamoto n.d.). The proposed "peer-to-peer cash system" used a combination of cryptographic protocols and a scheme of built-in incentives that allowed a decentralized network of computers or "nodes" to compete with each other to verify users' transactions and establish a common consensus record of exchanges, all without requiring any trust among participants in the system or third party intermediary. Over the following months, Nakamoto used this design to develop the original code for what would ultimately become the Bitcoin system. Notable features built into this system included an ultimate cap on the total supply of bitcoins that would ever be "mined," a set schedule of bitcoin production that would decline through time, and dissociation of personal identifying information of users with their transactions in the network (i.e. pseudoanonymity). These design choices (Desan 2017), in addition to the fundamentally decentralized and trustless nature of the economic exchanges facilitated thereby, were all meant

to replicate those properties of gold considered to be of central importance in right-wing and Austrian influenced models of monetary systems.

2.1 Accounting for Bitcoin's Worth

For all the performative (Callon 1998; Lawrence and Mudge 2019; Mackenzie 2003, 2006) adherence to these economic models in its design, Bitcoin faced a fundamental barrier in its ability to fully conform to them: as much as it resembled gold in certain key features, it lacked the type of intrinsic value the Austrian models posited as being necessary for a money to become initially established. At its material base, possession of a bitcoin amounts to no more than an entry in a shared distributed ledger. This lack of backing is a significant problem for the dominant explanations of the emergence of money[3] within the ideologies responsible for Bitcoin's founding. Arising first from Menger's (1892) account and continuing with Von Mises (1953) further development thereof, Austrian economics proposes money as initially originating from the presence of a "most saleable" (Menger 1892) commodity within a system. This model proposes that such a commodity may come to be widely demanded not only for its intrinsic value, but for the reliability with which individuals can expect that they will be able to trade it to others for other valuable goods and services. Over time, this initial emergent solution to the problem of the double coincidence of wants may reach a state of maturity where the demand for a money could reside solely in its ability to be reliably exchanged (Von Mises 1953). Without an object possessing this quality of intrinsic value *from the beginning,* however, such utilitarian, hyper-individualistic models encounter a collective action problem (Olson 1965) in explaining how such a "useless" object could achieve the required initial demand among a system of self-interested, atomistic actors to become established as an accepted medium of exchange.

As will be partially reflected in subsequent analyses, a few features of Bitcoin's design have been argued as imbuing it with some potential degree of intrinsic value, in spite of its lack of commodity-backing. One feature involves the ultimate upper cap placed on the total supply of Bitcoins that will ever be produced and the claim that this guaranteed limited supply imbues value per the ensured long-term scarcity of the cryptocurrency. Another prominent feature of Bitcoin, its intentionally designed capacity to facilitate anonymous digital transactions, is also sometimes identified as making it inherently attractive to a subset of adopters who are interested in conducting illicit online economic transactions - most notably to those participating in Dark Web marketplaces such as the Silk Road (Hout and Bingham 2013; Popper 2015). Of critical note, however, is that while both these features undoubtedly make Bitcoin appealing to a subset of adopters interested in it as either a speculative investment, a deflationary currency, or an anonymous electronic medium of exchange[4], all these potential use-values are still dependent upon a preceding establishment that Bitcoin will undoubtedly hold value to others. Without this reliable, shared expectation of being valued, a black-market vendor's willingness to accept Bitcoin in return for goods or a currency speculator's assumptions that others will value it more in the future remain untenable under Austrian conceptions of self-interested, rational action. As such, while Bitcoin may gain additional levels of inherent attractiveness once it has secured a network of adopters, the same initial collective action problem of acquiring its initial worth remains unsolved for Bitcoin when viewed from a Mengerian perspective.

2.2 Sociological Perspectives on Monies' Worth

Other theories that acknowledge the sociality of money, of course, offer many alternative accounts for how the social "claim" (Simmel 1978) of a money might come to be widely

established. As Graeber's (2011) authoritative work identifies, a survey of the actual histories of monies yield a few examples of their arising out of the systems of barter, per the Austrian account. The far greater majority, however, seem to originate as codifications of preexisting shared understandings of debt and credit relationships within the societies from which they arise. At a more abstract level, Searle's (2015) treatment of money as a constructed institutional fact that arises from processes of collective intentionality and assignment provides an abstract framework for understanding how interlocking perceptions and expectations can transform individual subjective interpretations of a money as having worth into a persistent, objective social reality. While useful scaffolding for thinking through the constitution of monies generally, both this wide historical view and abstract conceptual framework remain agnostic to the specific processes through which particular monies come to achieve their socially reified standing as objects that hold value.

One body of work that focuses more specifically on the particular avenues by which monies are constructed centers the role of the state in their creation, either through its ability to establish a common unit of account (Ingham 2004b, 2006; Keynes 1936), enact coercive enforcement of a money's use (Wray 1999), or through its intentional embedding of "general monies" (Polanyi 1957) in larger political structures in order to protect societies from the negative consequences of pure market systems. Other, more recent work (Polillo 2011) has added additional nuance to these views by considering how state-backed monies interface with local contexts by imbuing bankers with the moral authority to determine individual creditworthiness. These macro- and meso- level models clarify how, through the intervention of empowered central authorities, individuals can arrive at a shared assignment of value to an inherently "useless" object such that it becomes established as a money. The applicability of

these models to Bitcoin remains strongly limited, however, due to the explicit and purposeful disintermediation of central third parties from its design (Dodd 2018; Hayes 2019; Nelms et al. 2018).

Consequently, other monetary models focusing on the role of organic, bottom-up social processes become vital for the case of Bitcoin. For instance, classic anthropological work on the role of moral systems and ritual in providing the basis for small-scale societies' valuation of different "monies" (Mauss 1967) have some distant resonance with the combination of morality and shared practices that eventually arose in the Bitcoin community. In a related vein, contemporary work applying Durkheim's (1912) model of collective representation to the subject of money and the collective representations of value attached thereto (Orléan 2014) is also generally relevant. Of all culturally grounded perspectives on money, however, Zelizer's (Bandelj et al. 2017; Zelizer 1994, 2000, 2010) more detailed program on the social meanings of money provides the most relevant insights for explaining the initial construction of Bitcoin's value. Earlier research on the constitution of "special monies" via practices of "earmarking" ostensibly homogenous national currencies (Zelizer 1994) that are already commonly acknowledged as holding worth is largely tangential to the question of Bitcoin's initial acquisition of value[5] (but see (Lawrence and Mudge 2019) for a discussion on applicability of "counterearmarking" in this context). More recent articulations on the role of communities in constituting monies through the development of shared meanings and practices within circuits of commerce (Zelizer 2010), however, offer critical insights into how Bitcoin first came to hold economic value.

2.3 Facing Bitcoin's Conceptual Contradictions

The key perspective from the circuits of commerce (CC) model for making sense of Bitcoin's early development rests in its central recognition that participation in systems of exchange (i.e. using and accepting Bitcoin) delineated by particular transaction networks (i.e. the Bitcoin blockchain) and media of exchange (i.e. Bitcoin) often serve to reflect and reinforce the social relations of a group and the shared meanings embedded therein. The CC model specifically provides the explanatory traction needed to explain how a set of shared beliefs or ideology might lead individuals to collectively ascribe meaning to the apparently "useless" bits underlying a given bitcoin. It also clarifies how this ascription might further motivate participants to voluntarily contribute the considerable uncompensated labor and resources required for the system's initial technological development (Popper 2015; Shaw 2016), not to mention make them willing to accept Bitcoin in exchange for unambiguously valuable goods, services, and established fiat monies. As prior theoretical work on Bitcoin has already identified (Dodd 2018; Lawrence and Mudge 2019), however, the ability of this ideology to mobilize collective action toward the founding of a new money does so at its own, counterperformative (Callon 1998; Mackenzie 2003) expense.

To paraphrase Dodd (2018, p.37), to the degree that Bitcoin has succeeded as a money, it has failed as an ideology due to the fundamental incompatibilities that exist between its hyper-individualistic worldview and the inevitably social project of constructing a new money. To restate, the predominant ideologies shared among early Bitcoin participants has been attributed in varying proportions to a digital metallism that arose from its origins in Austrian economics and strong beliefs in the ability of technology to protect individual freedom and privacy from coercive centralized powers, specifically governments and established banks (Dodd 2017, 2018;

Hayes 2019; Lawrence and Mudge 2019; Maurer et al. 2013; Nelms et al. 2018; Swartz 2018). Were it not for the contradictions between the unavoidably social requirements of constructing a new money and the hyper-individualistic assumptions at the core of these worldviews, there might be little puzzle in how Bitcoin managed to establish itself as a monetary object possessing economic value. As it is however, the critical impasse between the early espoused theory of the community and the practices it ultimately expressed leads to fundamental questions concerning how these stark conceptual contradictions were managed and what their presence ultimately entails for our assumptions concerning the centrality of shared meaning in monetary phenomena.

The proceeding sections provide a partial empirical answer to these questions, and in the course of doing so, will posit a fundamental refinement to our understanding of the relationship between shared meaning and money. Specifically, the foregoing analysis will use a grounded computational theory approach (Nelson 2017) to demonstrate that at least within the communities considered, there was no significant convergence upon a single, shared explanation for *why* Bitcoin held value in the first years of its rise. Instead, it will show that as a result of mismatches between Bitcoin's ideological and material bases, increasing belief heterogeneity arising from the entrance of new members into the growing community, and most significantly, participants' confrontation with the practical challenges of spreading Bitcoin's adoption, the available evidence points instead to a conceptual *diversification* of abstract, explicit accounts for its value over time.

Rather than concluding that the resulting "bricolage of monetary principles" (Hayes 2019, p.53) undercuts the importance of shared meaning in monetary contexts, however, this analysis will go on to provide additional evidence for how these communities contributed to the social bootstrapping (Barnes 1983; Shaw 2019) Bitcoin's initial economic worth through

participants' persistent, interactional affirmation of each other in their shared belief *that* Bitcoin was valuable. Having provided empirical evidence for the primacy of these practical affirmations of worth in achieving the collective assignment (Searle 2005) of Bitcoin to the status of a valued money, this work will then conclude with some brief considerations of the implications of this refined understanding of the role of shared meaning in monies' constitution for the study of monies' origins more generally.

3. Data and Analytical Framework

In terms of the history of alternative currencies, cryptocurrency is unprecedented in many respects. One unique aspect of its development is the fundamental role public online forums played in its early development and spread. The digital communities surrounding Bitcoin have served as major arenas for the coordination of increasingly large-scale cryptocurrency projects as well as provided primary settings for discussion and debate on the project. These online forums, some of which have been present and operating since near Bitcoin's inception, also act as an archival record of the discourses and conversations which have accompanied the evolution of this new monetary object.

The two online communities most central to Bitcoin's early development are 'BitcoinTalk.org' and the Reddit hosted community, 'r/Bitcoin.' BitcoinTalk.org, the older of the two communities, was created in November 2009 by the pseudonymous creator of Bitcoin, Satoshi Nakamoto. At the time of data collection, it boasted over 650,000 users, 13 million messages, and housed 207 separate message boards organized by discussion topics ranging from 'Development and Technical Discussion,' 'General Discussion,' 'Altcoins,' and a variety of regional boards in a number of different languages. The Bitcoin Reddit community, 'r/Bitcoin',

was created after BitcoinTalk, in September 2010. As opposed to the earliest Bitcoin adopters that formed the initial basis for BitcoinTalk, r/Bitcoin membership has historically tracked toward newer entrants and recorded over 177,000 subscribers at time of initial data collection.

While these online communities were of central importance to Bitcoin in its early development, the restriction of this analysis to the text generated thereby strongly caveats its findings and entails they be understood as reflecting the limited subset of 'Bitcoiners' who were participating within them during the considered period. Further, given the unknown and unenumerated nature of the larger Bitcoiner population and the pseudo-anonymous nature of these communities, no claims can be made concerning their more general representativeness. Nonetheless, the centrality of these forums to the early phases of the Bitcoin undertaking and their fundamental role in helping catalyze the formation of a larger Bitcoin community makes the dynamics which played out within them significant in their own right and an important piece of the larger puzzle of how Bitcoin ultimately came to hold economic value.

3.1 Data Collection

The primary discourses of interest to this work are those reflecting participants' considerations of the concepts of money and value in the early phases of Bitcoin's development. To construct a window into these, I began by 'scraping' messages publicly posted in these communities from their inception through the June 30, 2015. The primary motivation for choosing this cutoff involves the massive influx of hundreds of millions (USD) of venture capital funding from establishment banking and finance groups into the Bitcoin and blockchain space beginning in 2015. This entrance of powerful outside actors profoundly altered the Bitcoin and cryptocurrency landscape in ways that bear notably on the present study. At the broadest level,

the increasing influence of these players and their wildly disproportionate ability to direct resources toward advancing their own interests ultimately marked major shifts in the scale, definition, and direction of the Bitcoin and cryptocurrency project (Shaw 2016). Given that the primary interest of this work is in the initial establishment of Bitcoin as a monetary object possessing economic value, an accomplishment that preceded these actors' entrance into the space and was arguably a main motivator for their initial attraction to the area, the choice of mid-2015 as a cutoff point represents a compromise between preserving as much information as possible while keeping the corpora appropriately reflective of Bitcoin's early, community driven period of development. .

Further motivation for this cutoff can also be linked to the increased divisiveness that arose within these communities following the entrance of these powerful interests into the Bitcoin "ecosystem" [6]. Prior to this time, heated conflicts were in no way unusual for these online forums and indeed, the presence of such arguments will be a feature of the proceeding analysis. However, the increased divisiveness over a particular set of topics on these forums is widely understood to have led to a dramatic increase in what is suspected to be extremely biased censorship by the moderators of these forums, most especially r/Bitcoin (Blocke 2016; Redman 2015). Prior to the middle of 2015, the selective removal of posts and comments by moderators was certainly occurring – a fact that further notably caveats the scope of this work's findings. Nevertheless, the widely understood increase in censoring that began in the middle of 2015 and resulting exit of many community members in protest, adds additional support for the decision to restrict this analysis to the specified time period.

In order to investigate participants' discussions addressing the nature of Bitcoin's and monies' value, it was necessary to develop targeted collection strategies that would help

disentangle these conversations from the much broader set of topics discussed within these forums to a level that would allow computational methods to identify them within the corpora. In the case of BitcoinTalk, I was able to leverage the community's own organization into topic-focused message boards toward this end. Of primary interest to this study were the "Economics" board, a forum devoted specifically to conversations on economics and the relevance thereof to Bitcoin, and the "Politics & Society" board, a forum devoted to topics related to Bitcoin in the wider context of political and social systems. While the decision to focus on these two boards undoubtedly entailed that relevant conversations in additional places such as the "General Discussion" board were missed, this narrowed scope provided for a significantly more tractable "signal to noise" ratio within the resulting corpora. Having selected these two message boards, I then built a set of "scrapers" to collect the text of every message made to each board prior to July 2015, along with its timestamp, author username, and the 'topic' or 'original post' to which it was related. I then constructed two independent corpora for each board and ran an independent series of exploratory topic models on each. Through this, I found that the computationally identified topics for the "Politics & Society" board were persistently unrelated to the questions of concern to the current investigation, and as such, I chose to exclude it from further analysis. This resulted in a final corpus of roughly 126,097 messages from the BitcoinTalk "Economics" board, posted between January 2010 through June 2015.

Unlike BitcoinTalk, r/Bitcoin does not organize its posts into topically themed boards. As such, it was necessary to begin with collecting the entire set of messages posted to r/Bitcoin through the defined cutoff. Using custom built scrapers as before, I collected the message text, timestamp, author, and the 'topic' or 'original post' to which it was related for every message. This process yielded an initial set of over 2.9 million posts and comments made to r/Bitcoin

between its inception in November 2010 through June 2015. While posts from the BitcoinTalk Economic forum could reliably be expected to reflect discussions of interest to this analysis, the initial r/Bitcoin corpora was substantially noisier due to its lack thematic organization. In order to hone-in more specifically on conversations related to value and money, I focused my analysis on a subset of posts constructed from the larger collection of just those messages containing some variant of the term "money" or "value" (see Appendix for details). While some relevant discussions were certainly missed using this criteria and others picked up that were not directly relevant to the main topics of interest, it was important to use a conservative set of terms that would not preferentially select messages reflecting a particular set of viewpoints[7]. After applying this criteria, I was left with a subset of 184,263 messages from r/Bitcoin.

3.2 Analytical Framework

Automated content analysis provides a powerful tool through which to extract large-scale, aggregate trends in large amounts of textual data (Grimmer and King 2014; Grimmer and Stewart 2013; Mohr 1998). Such approaches also have been criticized with regard to the extreme decontextualization of textual information they entail (Biernacki 2012). In order to balance both the benefits of large-scale statistical analyses of text with the richness and depth of qualitative analysis, I undertook a "computationally grounded" (Nelson 2017) approach to this analysis. The first phase in this framework involves using unsupervised machine learning methods to inductively identify themes of interest in the full corpora. These themes are then used to structure a "computationally guided deep reading" (Nelson 2017) and structure additional qualitative analysis of a subset of texts in the corpora that is aimed at developing a stronger understanding and articulation of those identified patterns. The final step then employs another phase of computer-assisted content analysis in order to corroborate the results of this second phase.

Adopting this structure, this analysis begins by developing two independent series of structural topic models (Roberts et al. 2014; Roberts, Stewart, and Tingley 2017) based on the two corpora of interest. To conduct these, the corpora were first prepared using standard text processing such as removal html tags and infrequently occurring words (see Appendix) and then combined with metadata on the date of the post as well as the daily closing market price of Bitcoin (BTC). Treating each post as its own document, I then ran a series of structural topic models using the 'stm' R package function "exploreK" to in order to identify the best justified choice of the number of topics(k) for each (k = 25 for the r/Bitcoin, k = 15 for BitcoinTalk:Economics). I then used the "selectModel" function of the same package to identify the best individual topic models for each based on coherence and exclusivity metrics, as well as interpretive relevance. Using the selected models, I then constructed estimates of the prevalence of topics in the corpora over time, controlling for market price.

From these initial analyses, I was able to then develop a framework for deep readings and a qualitative hand-coding of a random subset of 200 messages from the BitcoinTalk forum and, in order to compensate for its larger size and greater topical diversity, 500 messages from the r/Bitcoin corpora. In hand-coding this sample, I applied a directed content analysis approach (Hsieh and Shannon 2005) wherein I began with a focus on individuals' discussions of the origins or nature of money/cryptocurrency's economic value and discussions of social processes related to Bitcoin becoming established. From this initial pass, I was able to identify the presence of explanations from within and outside the right-wing economic models of Bitcoin's founding and a set of more "socially" oriented themes (e.g. adoption, convention, and a form of "investment agnosticism"). I used these to construct topic and subtopic codes that I then applied in a second pass of coding (see Appendix for full code list). In addition to this hand-coding, I

also undertook further deep readings of selected messages from the corpus and of the top messages that were identified as being most related to each of the focal topics (see Appendix).

As a result of these two phases of analyses, I identified a central pattern related to the diminished importance of the founding ideologies that inspired Bitcoin's creation in conjunction with the promotion of community practices that furthered Bitcoin's adoption and affirmed its value in practice. In contrast to identifying discursive themes, uncovering community practices via textual content presents an innately more difficult challenge. Fortunately, a subset of the practices that emerged within these communities over the early years of Bitcoin's development left sufficient digital traces to be somewhat detectable, and of these, I ultimately leveraged three for the last part of the analysis in order to corroborate the identified pattern. The first focused on applying a structural topic model to an additional corpus (627,825 messages) scraped from the BitcoinTalk Speculation board, a "child" board to the BitcoinTalk Economics group. The second used message frequencies over time in order to capture usage of a prominent Bitcoin meme, "HODL". The final part of this confirmatory analysis then identified the number of r/Bitcoin posts over time containing an html tag used to call a "changetip" bot, an automated program that allowed individuals to "tip" other Reddit users small amounts of Bitcoin.

4. Bitcoin's Confrontation with the Inevitable Sociality of Money

Figures 1 and 2 provide a sense of how the posting activity considered in this analysis unfolded over time in these two communities.

[Figure 1 About Here]

[Figure 2 About Here]

High-level, computationally derived summaries of topical trends in these posts provide a first pass insight into how the communities central to Bitcoin's development made sense of the monetary project in which they were engaged. A graphical representation of some of these trends are provided in Figure 3 and Figure 4. These graphs depict temporal trends in the estimated prevalence of certain key topics of interest (Table 1 and Table 2) within each community's corpus[8], controlling for both time and Bitcoin's (BTC) market price.

[Figure 3 About Here]

[Figure 4 About Here]

[Table 1 About Here]

[Table 2 About Here]

Though differences between these communities remain discernable even at this abstract level of statistical description, there exist some key points of similarity between them. Most specifically, we see in each evidence for a shift over time away from the metallist and Austrian ideologies of Bitcoin's founding in conjunction with an emergent emphasis on adoption. In the case of the r/Bitcoin corpus, this trend is relatively modest but is nonetheless discernable in the stability of the "mass adoption" related topic compared to the downward dips and gradual trend in the "metallism" related topic. The change over time in the BitcoinTalk Economics board is much more striking. Given the greater age of the BitcoinTalk community and its tighter association with the earliest adopters of Bitcoin, a group expected to have a stronger attachment to its founding ideals, the initial prominence of topics related to Austrian economics and Libertarianism is unsurprising. Unexpectedly, however, we also see a distinct transition in late 2013 when these topics begin to decline and are ultimately outpaced by an increasing prevalence of discussions that also relate to the issue of adoption.

It is important to note that the presence of a topic in these models does not entail the endorsement of a particular viewpoint. As the next section will demonstrate, for instance, there are many cases in which discussions invoking metallism do so in arguments against it. This can also be seen clearly in the "Argument (Austrian)" topic identified in the BitcoinTalk forum that seems to specifically capture arguments over the validity of such economic models. What these topics and trends can indicate, however, are the relevance of these themes to the communities' conversations through time. It is in this that we see the first indications of a transition within these communities away from conceptual debates over the nature of money and economic value and toward the practical and inevitably social issue of adoption. To get a better understanding of the shift suggested in these computational findings, however, requires a deeper, qualitative engagement with the content of these posts.

4.1 Digital Metallism and Its Discontents

Though its relative weight may have changed through time, both quantitative and qualitative analyses confirm the continued influence of Bitcoin's founding ideologies on collective discourses. Qualitative coding[9] and deep reading further reveal a tendency to evoke these concepts in the course of justifying Bitcoin as a worthwhile undertaking. One strong manifestation of this can be seen in a persistent preoccupation with the dynamics of inflation/deflation and the power dynamics inherent in central banking. These trends are viewable at the aggregate level (see the "Central Banking" and "Inflation/Deflation" topic in Fig. 1 and 2 as well as Tables 1 and 2) as well as in closer readings of the corpora:

> "Inflation and Deflation [sic] in the economy should be nothing more than market feedback to supply and demand, being able to spot the trend is the job of economists. Manipulating the Money [sic] supply to manage the trend is criminal. Holding the belief the money supply should grow and contract is akin to believing that reducing the supply or increasing supply of electricity to manage productivity is of benefit to all." (BitcoinTalk, 7/30/2013)

> "Firstly, deflationary currencies would improve the standard of living of the poorest amongst us by lowering prices for essential goods and services. By saving their money the poor would no longer be subject to the inflation tax as they are now. Secondly, deflationary currencies don't stifle investment. People can still choose to invest in whatever they wish however the potential returns on those investments should be greater than the economy's productivity gains. This would lead to more market-driven, prudent levels of investment…Bitcoin would move investment decisions away from centralized actors with hidden agendas to rational individuals." (r/Bitcoin, 3/18/2015)

These quotes capture a commonly articulated antipathy among community members toward the coercive and "criminal" nature of central banking systems and their pursuit of policy objectives through direct interventions on a nation's money supply. While a mainstay of contemporary economic policy around the world, schools of thought influenced by Austrian economics consider such interventions to be pernicious, disruptive influences on the functioning of markets (Golumbia 2016). As seen here in the proposition that deflationary currencies would benefit economically disadvantaged individuals, this ideology is also reflected in participants' simplistic characterizations of central banking induced inflation as "bad" and the deflationary effects arising from a strictly capped money supply as "good." The presence of this framing is also further indicated by a relative *lack* of discussion concerning Bitcoin's capped supply leading to problematic "deflationary spiral" dynamics. While participants frequently point to the potential for Bitcoin to continue gaining value through time due to its limited supply, much less is said regarding how this incentive to hoard Bitcoin is fundamentally at odds with the currency's ability to act as a medium of exchange. Though some have acknowledged this potential long-term problem with Bitcoin (Anon 2010; Rodriguez 2018), its significance remains downplayed even as the purported benefits of deflation are emphasized.

Another manifestation of the persistence of the broadly anti-government orientation of Bitcoin's founding, one which obliquely anticipates the practical issue of adoption, becomes

most evident through a propensity identified via hand-coding to situate Bitcoin in relation to macropolitical events. [10] Most notably, these discussions show a tendency toward positioning Bitcoin as a potential "disaster hedge" for individuals wanting to protect their holdings in the face of national currency destabilization:

> "Argentina and Venezuela with some others countries of South America have very unstable economy plagued by huge inflation, volatile national currency, low GDP and restricted laws for citizens who want to invest money abroad. I think people are starting to notice that Bitcoin could be a help to overcome all these problems." (BitcoinTalk, 7/3/2015)

> "…in the present system, with so many people struggling under dictatorships, any lovers of justice should support an anonymous currency that helps them fight back" – (r/Bitcoin, 12/14/2013)

The most notable persistence of the Austrian and right-wing economic perspectives which gave rise to Bitcoin, however, is reflected in the presence of the "metallism" topics in each community (Fig. 1 and 2.). These computationally identified themes indicate that for a money lacking any backing by precious metals, references to them occur with striking frequency. While this might be partially attributable to recounts of Bitcoin's origins, qualitative analyses reveal that references to precious metals had a pronounced tendency to occur in discussions on the nature and origins of economic value:

> "Dollars have value because people are forced to use them. Bitcoins, and gold, have value because they are useful, the former as solely a means of exchange, and the latter as both means of exchange and for ornamental/industrial uses."
> (r/Bitcoin, 7/26/2013)

> "Gold has unique physical properties. It "backs" itself. True. And similarly, Bitcoin has unique properties… Both gold and btc are valuable as money precisely because of their unique properties. Neither needs to be, or ought to be, or even can be, backed by another commodity."
> (BitcoinTalk, 6/19/2011)

Frequently, the stakes of metallism influenced conversations centered on the concept of "intrinsic worth" and whether Bitcoin possessed it. As illustrated in the following, there was no consensus on the answers to these questions:

> "As another commenter pointed out, 'oh god, the does-bitcoin-have-intrinsic-value argument again.' But I'd argue that it does have intrinsic value since owning bitcoin allows you to participate in the distributed, trustless payment network associated with it." (r/Bitcoin, 6/11/2014)

> "Well unlike bitcoins gold actually does have some intrinsic value. Gold is valued for its beauty in jewelry and its conductive properties in electrical/technological applications. A bitcoin on the other hand actually has no true intrinsic value." (BitcoinTalk, 12/10/2013)

> "Food and gold have intrinsic value; this is not subjective. The 1s and 0s that comprise bitcoin cannot be used for any useful purpose apart from its use as a medium of exchange. Bitcoin has no intrinsic value; this is not subjective." (r/Bitcoin, 4/26/2014)

Given the material facts of Bitcoin's existence, specifically its lack of clear intrinsic value, one might posit that the counterperformative realities of cryptocurrency would inevitably lead to a fundamental impasse between its founding ideology and its practice. And indeed, there is little in these corpora to suggest anything resembling a consensus view on these matters had arisen by the middle of 2015. Given the growing ideological diversity of these communities due to increasing involvement from individuals beyond the groups of its origins, one might further expect that this conceptual impasse to lead the Bitcoin project to abandon the Austrian and right-wing economics of its origins. Concordant with this expectation, findings from the preceding section (Figure 1 and 2) do indicate that the prevalence of the topics related to gold and the larger issue of intrinsic value did wane over time, though they remained a subject of debate throughout the period considered.

If Bitcoin as an undertaking was subject to the Mengerian models of its origins, its lack of any clear source of intrinsic worth should have doomed the project from the outset. If its success as a money instead required a common, explicit understanding of what gave it worth, these conceptual impasses and divergences would also indicate that it would not succeed in acquiring worth. Nonetheless, it has done so, to a degree that even its founders could not have anticipated. These engenders the question then of how this was achieved? A complete answer to

this question would involve consideration of wide number of social and economic processes that go far beyond the scope of the present work. The following sections, however, develop and provide support for the argument that a critical part of Bitcoin's success arose from these communities' organic transition away from theories of money and toward the practical necessities of adoption.

4.2 Confronting the Practical Necessity of Adoption

For a money to succeed, it must be understood as having value to those holding it *and* be reliably expected to be viewed as valuable to others. Menger's solution to achieving this coordination rested upon an assumption of individuals' atomistic self-interest in acquiring intrinsically valuable commodities. As established though, for all the performative adherence to these models in its design, the "useless" bits underlying a bitcoin did not possess this trait. As a purely theoretical matter, this incompatibility might have been something that could be collectively put aside with little real consequence for the undertaking. Justifying the long-term viability of the project and developing compelling explanations for its early increases in market valuation, however, could not avoid confronting the fundamental problem of why others would decide to exchange items of known worth, be they services, goods, or fiat monies, for this digital object.

Dealing with this practical necessity of establishing an adoption base, while a concern for all types of monies, is an especially pronounced one for a money striving to achieve global, general use. Bitcoin initially benefitted in this regard from having an early set of individuals who became involved with it due to their affinity with the ideological and/or technological aspects of the project. A bit later in its early development, its adoption was further expanded by those

acquiring it for use in online transactions in illegal, darknet marketplaces (Popper 2015). As the project grew, however, the problem of how to establish a demand for Bitcoin beyond these relatively small communities became an increasingly unavoidable subject for participants, as already partially reflected in the preceding computational analyses.

Many of these conversations about adoption maintained a distinctly "economic" tone per references to "network effects" and frequent comparisons of Bitcoin's situation to the early adoption of technological innovations (e.g. through invocations of Metcalfe's Law):

> "As more people use it, demand for a bitcoin will be higher. Since it has a finite supply, price per unit will naturally rise. That [is] the effect of adoption that can be simplified to a supply and demand curve. More users and a limited supply increases price but we can also look at it from a S-Shaped adoption curve etc. to determine how it moves. That and Metcalfe[']s law." (BitcoinTalk, 7/10/2014)

Qualitative coding reveals additional themes, however, that bear a distinctly sociological bent. Of these, three in particular resonate with a class of practical affirmations of worth that will ultimately be of central interest in this analysis.

The first reflects an organic response to the problematic aspects of metallism for Bitcoin. Though none of the statements analyzed qualitatively invoked formal theories or academic sources, they can correctly be characterized as expressing an informal "conventionalist" (Orléan 2014) or "constructionist" (Zuckerman 2012) view of economic value:

> "Yes, but its value is still subjective, golds [sic] value is also subjective, all value is subjective, nothing has intrinsic value, so I never understand why pointing out that Bitcoin has no intrinsic value [is relevant] in any case." (r/Bitcoin, 7/26/2013)

> "I do find this point of view [that Bitcoin's value comes from computation behind it] confused and misguided: the Bitcoin protocol is backed by mathematics. The economic value isn't. I don't understand why people can't accept Bitcoin isn't backed by anything other than faith in it. It doesn't matter, all value is the same in the end, even the value of gold." (BitcoinTalk, 2/28/2014)

> "All value is whatever people say it is, there's some myth of intrinsic value but it's just a symptom of people having weird ideas about money." (r/Bitcoin, 7/27/2015)

Though the presence of these viewpoints and their contradiction of Bitcoin's originating ideology are notable, this understanding of what is essentially the socially constructed nature of money's value did not ultimately provide a solution to the previously described conceptual impasse in as far as it did not ultimately become the basis for an explicit, consensus account of worth. Nevertheless, these sentiments can be argued as having provided important conceptual scaffolding for justifying claims that Bitcoin had real value so long as people, be they within or outside the community, ascribed value to it.

While the emergence of this counternarrative of money's worth constitutes an important intellectual development in Bitcoin's history, the more dominant emphasis in these discussions was on the pragmatic actions that could be undertaken to further Bitcoin's adoption by wider audiences. These conversations veered away from ephemeral debates over the nature of value in favor of discussing what might create concrete demand for Bitcoin beyond its core communities. Popular considerations in this arena include advocating community members to be proactive in asking merchants to start accepting Bitcoin and supporting those who already did, developing consumer-friendly interfaces that would make Bitcoin easier to use for the "Average Joe," and developing Bitcoin applications in arenas where reliance upon the existing banking and finance sector tends to be difficult and expensive (e.g. remittances, micropayments) :

> "My interpretation of the [original post] is that the average user does not need to learn about the theory of money or our the [sic] current monetary system. They need a simple to use front end. Maybe a video that shows how transactions can be sent (only need destination address and your key). Trying to explain WHY bitcoin makes sense is a really tall order. Trying to explain HOW to use bitcoins is much simpler." (r/Bitcoin, 3/26/2013)

> "This remains the biggest chance for crypto. There should be a global organization dedicated to promote bitcoin as a means to transfer funds in low wage countries. This guy is gonna [sic] try bitcoin next order, simply because I explained it to him as a way to avoid those ridiculous high costs...In short, how could we as a community promote this." (BitcoinTalk, 6/17/2015)

> "For merchants Bitcoin favours the little guy, which is a nice change, there are no start-up [costs], can take international payments and you don't even need to touch a bank if you make the stuff yourself for example. So someone with no bank account and no ability to get a paypal [sic] type account and has no access to payment networks like Visa can still get into business...+1 to the millions of people who [can't] access traditional banking. Now this doesn't mean the coin $ value will go-up, but Bitcoin is an idea for the people, with these being so few and far between [its] value to millions of people is the opportunity it offers not what they can sell a coin for." (BitcoinTalk, 6/11/2104)

> "Yeah, it may take a while for the adoption curve to accelerate. But in the meantime, the people who were most willing to invest time and effort to understand and use Bitcoin early will continue building the infrastructure. Others who are a little less willing to be early adopters will probably see the growing infrastructure and hop on the bandwagon. That progression from early adopter to late adopter will continue until nine-to-five Joe can start using Bitcoin as easily or easier than it is for him to manage his money at Wells Fargo." (r/Bitcoin, 6/4/2013)

Numerous anecdotal accounts and popularized stories such as that of the first exchange of Bitcoin for a real-world good, a highly symbolic transaction in May 2010 between two BitcoinTalk members who exchanged 10,000 BTC for two large pizzas (Popper 2015), give reason to believe these types of discussions did occasionally connect to tangible actions. The full extent of these actions, however, and their consequent effectiveness in expanding Bitcoin's adoption cannot be directly discerned through the available data[11]. Nonetheless, the existence of such discourses point toward the presence of a shared, mutual affirmation of Bitcoin's worth. The development of this practical, increasingly taken-for-granted understanding of Bitcoin as possessing value and a shared orientation toward convincing others beyond the community to believe constitutes a collective achievement in its own right. While there may be little evidence of these communities converging upon an abstract understanding of *why* Bitcoin had worth, these discourses point to a collective coordination upon a shared understanding *that* Bitcoin was valuable and *should be expected* to be seen as valuable to others as well.

These practical, mutual affirmations of Bitcoin's value did not entail a naïve assumption that everyone buying into the currency from outside the community ascribed the same degree of importance to it, however. While the development of special monies that are meant to reinforce a

specific community might push back against such uncommitted interlopers with boundary keeping actions (Zelizer 2010), the continuing orientation of the Bitcoin project toward achieving the status of a general, global money entailed a more complicated relationship with outsiders. This is seen most tangibly in Bitcoin communities' grappling with the increasingly undeniable role of casual, highly uncommitted speculators in driving up Bitcoin's market price.

As with other subjects, neither community's discourses could be characterized as having achieved a widespread consensus on the role of speculation and speculators in Bitcoin's success. A reoccurring theme that can be readily identified, however, was that in spite of characterizations of speculators as underinformed and even immoral participants, the influx of large-scale demand and consequent rise in Bitcoin's price it engendered was likely an unavoidable, and possibly important, phase in the project's maturation

> "I don't understand why people keep trying to draw a line in the sand between currency and speculation, do you just love conflict? Speculators are only helping to increase the adoption rate of bitcoin. This is a necessary phase of bitcoin adoption as a currency, once the volatility stabilizes in the years to come, because most everyone knows about it and has made their decision on buying in or staying out, it will be in a perfect position to act as a currency." (r/Bitcoin, 11/9/2013)

In a way distinct from considerations of what community members might do to promote the adoption of Bitcoin more widely, acceptance of speculation in Bitcoin's development and the associated acknowledgement of the personal benefits the related increase in the market valuation of one's own holdings reflects a more utilitarian, but nonetheless shared, practical confirmation of Bitcoin's economic value. Specifically, it played a role in establishing what might be characterized as a prevailing, "investment agnosticism" defined by a *de facto* deprioritization of theoretical matters concerning the fundamental basis of Bitcoin's worth in favor of practical strategies for investing in its long-term potential while accommodating for its near-term price volatility:

> "Ultimately you need to let coins go to help distribute the risk and benefits, the wealth doesn't come into Bitcoin purely because of lack of supply, so this RAKE and SSS plans [cryptocurrency investment strategies] gets my support... Embrace the volatility, it is spreading the risk and benefit." (BitcoinTalk, 11/28/13)

> "If you see Bitcoin as a long-term store of value or as an investment, then there's no need to stress yourself attempting to save a few bucks per coin. There will always be events (both good and bad) that nobody saw coming that'll push the price around. However, if you budget to make a daily, weekly, or monthly automatic purchase then you won't fret that you're missing out or getting screwed since it'll get averaged out in the long run." (r/Bitcoin, 12/17/2014)

The discursive themes explored in this section reflect Bitcoin's evolution from a narrow, rigidly performative monetary proposal into a community project confronting the inevitably social problem of establishing a money. One question raised by these themes is whether the emergence of a distinctly conventionalist approach to Bitcoin's value, and its associated admission that money's value may originate in groups' treatment of it as valuable, was a necessary part of this transition. These findings also provide the foundation for another, stronger assertion that the establishment of Bitcoin as a money was less of a conceptual accomplishment and more of a practical one in which a community of core participants, motivated by any number of justifications, affirmed its value via their own actions and interactions to a sufficient degree that they successfully bootstrapped its early ascriptions of worth. Confirming the existence of such value affirming, community practices via textual data presents its own unique set of challenges. Nevertheless, the following section considers signs of a potential subset of such behaviors that left sufficient digital traces to be picked up by computational analysis.

4.3 Computationally Discerning Signs of the Practical Affirmation of Bitcoin's Value

Close readings of parts of these corpora yield many examples of members engaging in community strengthening activities from freely sharing educational resources, to walking newcomers through the field of cryptocurrency, to creating a wealth of visual "meme" content

that expressed and reinforced Bitcoiners' sense of collective identity. Another concrete manifestation of this community-driven action can be seen in the creation of additional online boards and forums connected to these original boards. For example, the founding of boards such as r/Jobs4Bitcoins and the BitcoinTalk "Marketplace" and "Trading Discussion" boards indicate practical efforts to support Bitcoin's exchangeability for real world goods and services, while other like r/BitcoinBeginners and the "Beginners & Help" BitcoinTalk board provided arenas for experienced community members to offer free help and advice to new potential adopters.

In terms of sheer membership volume and activity, the most significant of these affiliated online forums is the BitcoinTalk 'Speculation' board, a designated "child" board of the BitcoinTalk Economics forum. Though it was founded after the main Economics forum and had relatively little activity in 2010, at the time of this writing the Speculation board boasted over 1.5 million posts of its own. Applying the same structural topic modeling approach as before to a set of 607,069 scraped messages posted to the Speculation board prior to the mid-2015 cutoff, yields a set of topics that, unsurprisingly, primarily focus on Bitcoin's price movements and investment strategy rather than on deeper issues such as the nature of economic value (see Appendix for full topic list). Nonetheless, two of the identified topics described in Table 3 do bear a striking resemblance to those found in its "parent" Economics board.

[TABLE 3 ABOUT HERE]

[FIGURE 5 ABOUT HERE]

While these topics resemble those in the Economics forum, it is worth noting that in terms of their relative prevalence through time (Figure 5), the transition away from discussions of intrinsic value to those of adoption happens much sooner. This trend of deprioritizing theoretical considerations of why Bitcoin has value, along with the pervasive, implicit treatment

of Bitcoin as if it were an established commodity through the frequent transposition of finance terminology (e.g. "bull trap", "bearish", "bubble") and techniques (e.g. price forecasting using chartist or technical analyses) to the Bitcoin market, reflect and reinforce a collective, practical understanding of Bitcoin as an object *that* holds value even if it does not resolve the question of *why* it does so.

In addition to affirming the existence of a community of others who also attributed value to Bitcoin, these online forums were also incubators for the development of other shared practices that further reinforced individuals' assignment of worth to the nascent money. Unfortunately, many of these actions are not easily detectable through automated content methods used here, but the emergence of one of Bitcoin's most widespread and well-known memes, "HODL", and its association with a particular investment orientation leaves a noisy digital trace of such activities. The "HODL" meme is cited as originating from a purportedly inebriated misspelling of the word "HOLD" in a post to the BitcoinTalk Speculation board in mid-December 2013 by a member discussing their lack of expertise in trading and their decision to not sell their Bitcoin holdings in the midst of a Bitcoin market price crash[12]. The misspelling was rapidly taken up by other forum participants and subsequently spread across numerous other online communities, ultimately becoming a frequent Bitcoiner exhortation during significant price drops. The relationship between its usage in the Speculation board, the full (i.e. non-subsetted) r/Bitcoin corpora, and Bitcoin's (BTC) market price can be seen in Figure 6.[13]

[FIGURE 6 ABOUT HERE]

Though it began as a spontaneous, individual response to bad investment luck, HODL eventually came to take on additional elements of a moral imperative. At its most instrumental, the admonishment to "just HODL" through periods of fear, uncertainty, and doubt (FUD) is

regularly justified by appealing to examples of others who bought into the cryptocurrency early, held onto their Bitcoin through prior crashes, and ultimately came out orders of magnitude ahead on their investment. Alongside this appeal to the self-interested rationality of long-term investment, however, another community-based rationale arose wherein "HODL" also became a mutual entreating to resist panic-selling in service of the greater collective project of establishing Bitcoin as a real store of value (Dierksmeier 2018). Especially at the level of aggregate trends, it is difficult to disentangle the degree to which authors' usages of this term reflected a deeper moral commitment to the community project or the emotive exclamation of a fundamentally selfish speculator who wanted their investment's crashing price to stabilize. This analysis further cannot discern what if any effect the community practice of HODLing had on Bitcoin's market valuation, either in the immediacy or the long-term.

Nonetheless, it is worth considering how the development of this meme was ultimately taken up by a core of committed individuals who used it to affirm Bitcoin's long-term value and admonish others to not waver in their own commitment to the project (Dierksmeier 2018). This community ballast for Bitcoin's valuation undoubtedly arose in part from a significant subpopulation of speculators motivated by their own selfish, utilitarian interests in seeing their own investment decisions pay off. Nonetheless, the usage of this popular meme also became a way for some committed participants to express a sense of belonging to a larger project whose importance went beyond their immediate personal interests. By turning the decision to hold into a public action that reminded other community members of their common commitment to their monetary project, this phrase arguably helped to reflect and reinforce the group's collective assignment of a level of value to Bitcoin that went beyond fluctuations in its market price.

Another, even starker deviation from Bitcoin's original idealizations of self-interested, rational action can be seen in a final example of the creation and usage of the "changetip" bot on r/Bitcoin. In the context of online forums, bots refer to autonomous programs that independently interact with users and forums, and in cases such as this one, that can be "called" by users through inserting lines of html code into their posts. The "changetip" bot was initially developed in 2014 as a means of sending "micropayments" of Bitcoin to others. After preloading changetip accounts with Bitcoin, users were able to send small "tips" to others as a way of expressing appreciation for their posts. If the receiving user did not already have a Bitcoin account, they could claim their "tips" by creating a new Bitcoin wallet. By August 2014, changetip's functionality was extended beyond Reddit, to other platforms such as Tumblr, YouTube, Twitter, and Google+. Shortly thereafter, it experienced a "viral" moment in October 2014 (Dalais 2014). Though establishing causality is difficult, Bitcoin's market price did experience a modest increase during that same time.

The fact that calls to the changetip bot relied upon inclusion of a specific html tag makes it possible to extract every instance of such calls in the full, non-subsetted r/Bitcoin corpora (see Figure 7). To emphasize, these data do not reflect *discussions* of the changetip bot but actual *uses* of it. Particularly notable features include the reflection of changetip going viral in late 2014 and its usage both prior and subsequent to this faddish moment of widespread popularity.

[FIGURE 7 ABOUT HERE]

The emergence of tipping through the 'changetip' bot offers an example of how perceptions of Bitcoin's worth were mutually affirmed through the collective practice of using its exchange to express valued interactions. There was also no lack of awareness within r/Bitcoin that using the bot offered an attractive avenue through which to spread awareness of Bitcoin and

that promotion of the custom of "tipping" also supported the larger undertaking of Bitcoin becoming established. This community-oriented, arguably somewhat altruistic practice of spending one's own money to further collective goals stands in stark contrast to the hyper-individualized economic theories that originally inspired Bitcoin's creation. As striking as this incongruency might be, however, it was never sufficiently important that it impeded its spread through the community.

Whether any of these provided examples of community-oriented, value affirming practices were necessary to Bitcoin becoming established as a money cannot be established here. Taken as indicators of the existence of a much larger body of such activities[14] that are not as readily detected through the current textual approach, however, they offer some traces of a computationally discernable confirmation of an important transition that was also reflected in the shifting emphasis of these communities' discourses through time. Most namely, they demonstrate how in confronting the inevitably social project of establishing a new money, the incompatibilities between Bitcoin's founding theories and the practical necessity of spreading the adoption of a digital money without material backing was a matter that ultimately required not a conceptual resolution, but an enacted one. Stated more succinctly, these results clarify how a shared understanding of *why* Bitcoin had value was ultimately less important than establishing a strong mutual affirmation *that* it had value in practice.

5. Discussion and Conclusion

Through a computationally grounded approach, this work has endeavored to deepen our empirical understanding of how Bitcoin, in the face of stark conceptual contradictions between its material basis and the economic ideologies of its founding, nonetheless succeeded in

establishing itself as an economically valuable money. By applying structural topic modeling to 100,000s of messages generated by two online communities central to Bitcoin's early development, this work identified both the persistent influence of its founding ideologies on these communities' discourses and another, emergent focus on practical issues related to its adoption. Using a combination of qualitative coding and deep reading, it unpacked these aggregate trends to demonstrate the community's failure to achieve a conceptual consensus on either the nature of economic value or on an explicit justification for why Bitcoin should be considered to possess it. This analysis also showed, however, that even in the absence of a shared, explicit understanding of why Bitcoin had value, the practical necessity of achieving wide-scale adoption in order for the project to succeed ultimately set the basis for a confrontation with the inevitably social requirements of establishing a new money. In addition to making room for more conventionalist (Orléan 2014) conceptualizations of economic value, this confrontation provided a collective impetus to shift focus away from conceptual issues toward the development and promotion of activities that practically affirmed and advanced the communities' shared belief *that* Bitcoin had value. Having identified this shift, the final part of the analysis then provided examples of available digital traces to help corroborate the presence of some of these practically affirmative activities.

Within the study of money, Bitcoin is unprecedented in numerous respects. From its origination in pseudonymous online communities, to its global reach and algorithmic basis, to the ambiguity in its classification as a money or technology (for explorations of other imaginaries that have been attached to cryptocurrency, see (Hayes 2019; Maurer 2017; Shaw 2016; Swartz 2018)). As such, there are many reasons to exercise caution in claiming its comparability to other cases. Further, while extensive, the data used in this study captures only

one aspect of the much larger Bitcoin undertaking, one that centers on a notably caveated subset of conversations and activities from two online forums. This entails that there are many aspects of Bitcoin's development left unconsidered here, any number of which could feasibly prove to have been as central in its establishment as a money. Additionally, it is also important to bear in mind that even though its decade of existence and substantially increased valuation since its inception justifies the need to seriously engage with Bitcoin as a monetary project, it and cryptocurrency more generally remains relatively nascent in their development. Much is left to be written for their futures and real possibilities remain that they will ultimately fail, or succeed, but not as monies.

Bearing these limitations of the case and present study in mind, this analysis does still yield new insights that are important for the sociological study of money more generally. Chiefly, it has reaffirmed the central place of shared meaning in explaining money while offering a sharp clarification of the relative importance of common explicit conceptualizations of *why* a money holds value compared to widespread, mutual affirmations in a shared belief *that* it holds value in practice. This work accomplished this by leveraging the unique irreconcilability of Bitcoin's materiality with the ideology of its founding in order to demonstrate how the economic value of a money can be bootstrapped by a community holding divergent views of the source of its worth, so long as members can still reflect and reinforce each other in their assignments of it as having value. In so doing, it not only provided empirical support of prior theoretical observations (Dodd 2018), but also sharpened our focus on what type of shared meaning is at issue in the construction of new monies' economic valuation.

The proliferation of cryptocurrencies that have been subsequently developed from Bitcoin's original design (i.e. "alt-coins"), and the numerous communities and value propositions

that have accompanied their creation, provide numerous settings in which future research may vet and refine the insights developed in this work. Additionally, these findings also offer a new lens through which to view more well-established and traditional types of monies. If, as this study suggests, a shared, explicit understanding of the source of a money's value is secondary in the establishment of its worth with respect to achieving the collective assignment of it as being valuable in practice, then the object of sociological analyses of monies' origins finds reason to hone in on identifying general classes of mechanisms through which this coordination of expectations can be achieved and on investigating the particular, historically contingent and path-dependent (Arthur 1994; Mahoney 2000) sequences by which this coordination was accomplished in specific instances. In some cases, this might arise from a powerful third party actor acting as a central focal point (Schelling 1960) which allows a large population to coordinate upon a common expectation that a money will have worth to others. An argument can be that this is what occurred in the early 20th century "monetary miracles" in which failing German and French national currencies suddenly re-stabilized after different symbolically important actions by the respective governments unexpectedly induced large portions of the population to return *en masse* to the expectation that the currencies held practical value again (i.e. restored public confidence in them) (Orléan 2014, p. 166 - 170). In other cases, participation in widespread religious rituals (Durkheim 1912; Mauss 1967) or common knowledge of systems of commitments within an existing community (Graeber 2011; Zelizer 2010) might be understood as providing the framework for establishing the is mutual affirmation of a money's worth.

Ultimately, the goal of this empirical investigation into how the first cryptocurrency acquired economic value has been to reinforce the primacy of shared meaning in explanations of

money, but to do so in a way that clarifies how this meaning of money is fundamentally "something accomplished and revealed in its use"(Carruthers and Espeland 1998) in contexts involving the constitution of new monies. By leveraging the inherent ideological contradictions of Bitcoin and the digital record left by community members over its early development, this work has sought to foreground the primacy of mutual practical affirmations over conceptual convergence in explaining how groups are able socially bootstrap (Barnes 1983; Shaw 2019) the economic worth of new monies. Viewed from a perspective that is sensitized to groups' ability to precipitate out real economic value from members' affirmation of one another other of its existence, the mysteriousness that Menger (1892) and others have ascribed to monetary phenomena readily gives way to a straightforward recognition of their inevitably social bases. So understood, we as researchers are ourselves given license to move beyond abstract perseverations on why a money has value and onto more generative inquiries concerning the specific histories by which particular societies first came to commonly regard a particular money as having value in practice.

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[1] https://coinmarketcap.com/

[2] For a compelling historical comparison of further parallels between Bitcoin and one the most significant metallist systems in history, Potosí silver, see (Zimmer 2017).

[3] Austrian economic models tend to offer a stricter definition of money as *the* most widely accepted medium of exchange within a system with other, less widely used medium of exchange being more like money substitutes (Von Mises 1953; Šurda 2012). The same problem and reasoning applied to the origins of money can, however, be applied to the origins of widely spread money substitutes.

[4] The long-term incompatibility of these two proposed functionalities of Bitcoin reflects another level of self-defeating counterperformativity within the project. Afterall, if the value of money is expected to only rise in the future, the incentives of using it as a medium exchange in the immediacy declines. Much gratitude to an anonymous reviewer for this astute observation.

[5] The emerging practice of creating new digital tokens that are based on existing cryptocurrencies for the development of specialized decentralized applications and platforms, however, offers tantalizing similarities.

[6] This divisiveness is probably best epitomized by the exceptional acrimony that began heating up in the second half of 2015 centering on the so-called "block-size" debate. This debate over how a fundamental technical feature of Bitcoin – the limit on how many transactions could be handled in a single block – should be changed to accommodate increasing usage of the system became so vitriolic, it spurred death threats, community ostracizations, and by 2017, a "hard fork" of Bitcoin into two separate currencies.

[7] For instance, inclusion of the terms "gold" or "fiat" run the risk of preferentially biasing the resulting set toward "metallist" discussions, while inclusion of the term "exchange" has the capacity to lead to a noisier mixture of discussions on not just money/value, but also news on major currency exchanges.
[8] See Appendix for lists of additional topics.
[9] Distributions of substantively important topic and subtopic code applications for the sampled corpora are provided in the Appendix (Fig. 1A and Fig. 2A), as well as a full topic and subtopic code list (Table 3A).
[10] One of the most notable reflections of this orientation can be seen in topics focused on specific countries undergoing financial crises (e.g. Greece). Due to the event-driven nature of these discussions (i.e. their being tied to specific countries at different times), unsupervised learning methods used here make it difficult to identify this broader theme through word cooccurrence alone. Nonetheless, this tendency is partially detectable in the full topic lists provided in the Technical Appendix.
[11] Ideally, one would be able to make direct connections between individuals' conceptions of Bitcoin and the patterns in their usage of it. Unfortunately, the pseudoanonymous nature of both these online forums and the usage of the currency makes this a difficult task that goes beyond what is available through the present data. Work in progress, however, will partially address this through using a broader set of data sources to investigate the imaginaries various adopter groups have attached to Bitcoin.
[12] https://bitcointalk.org/index.php?topic=375643.0
[13] Regressing raw frequencies of occurrences of the term "HODL" on relative change in Bitcoin's market price from the previous day for each forum yields a significant ($p < .05$), negative estimates of the relationship for both.
[14] See (Popper 2015) for an authoritative journalistic account of more of these activities.

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Appendix

A1. Initial Data Collection and Processing

Posts from r/Bitcoin and the BitcoinTalk.org "Economics" forum were initially collected in October 2015 via web scrapers and crawlers built using the Python "scrapy" package. The initially collected corpora represent all posts to each community that were publicly viewable at the time of collection. In addition to its text and time of posting, I collected information on authors and whether the message was an original post or a reply thereto. In order to further narrow the focus of the r/Bitcoin corpus, I used regular expressions to construct a subset from the full corpus of all posts containing variants of the stems "mone" or "valu" (case insensitive).

After using regular expressions to remove website addresses and html tags from posts' text, I utilized the "textProcessor" function from the R "stm" package to carry out the standard text processing steps of removing stopwords, punctuation, numbers, and words less than three characters long, as well as to stem words and convert them to lowercase. I then used the "prepDocuments" from "stm" package to remove words occurring in less than 100 posts and convert the respective corpora into the document, metadata, and vocabulary objects required to generate structural topic models.

A2. Structural Topic Modeling

Given the sensitivity of topic models to the choice of number of topics (k), I began by using the "searchK" function on each of the corpora to evaluate a range of values between 5 and 35 topics. After comparing tradeoffs between the standard metrics of semantic coherence and exclusivity across different values of k for each corpus, I settled on the choice of (k=15) for the BitcoinTalk Economics corpus and (k=25) for the subsetted r/Bitcoin corpus. Using these values, I then applied the "selectModel" function in order to run a series of topic models on each corpus for the selected value of k in order to identify the best performing models with regard to semantic coherence and exclusivity.

Using the "labelTopics" function, I was able to then construct descriptions of each model's identified topics from the top 15 words associated with each. All identified models for each corpus contained strong

similarities in the topics found, and I selected the models for each corpora with the greatest degree of interpretability and applicability to the analysis (see Table 1A and 2A for descriptions of topics not included in the main analysis). Once selected, I used these models to generate estimates of the relative prevalence of each topic over time, controlling for changes in Bitcoin's closing market price. Using the "findThoughts" function, I was also able to extract the top 20 posts associated with each topic in order to verify my description and interpretation of them as well as select related messages for further close reading in the second part of the analysis.

[TABLE 1A ABOUT HERE]

[TABLE 2A ABOUT HERE]

A3. Qualitative Coding

[TABLE 3A ABOUT HERE]

A4. Confirmatory Computational Analyses

In order to confirm patterns identified through the previous two stages of analysis, I modified the scrapers built for the initial phase of analysis in order to collect the all publically visible posts to the BitcoinTalk Speculation board. Data was collected in March 2019, but only messages posted before the established cutoff of July 1, 2015 were used in this analysis. After using the same procedures to process the corpus used in the initial stage of analysis, I applied a similar set of steps to generate a structural topic model (k = 15) to generate the estimated prevalence of topics through time, controlling for market price, and verify my interpretation thereof (see Table 4A for list of additional topics not included in the main analysis).

[TABLE 4A ABOUT HERE]

For the other two parts of this last phase of confirmatory analysis, I utilized the corpora from both BitcoinTalk boards and the full, unsubsetted r/Bitcoin corpus. In order to evaluate usages of the "HODL" through time, I applied regular expressions to extract all posts containing the term (case invariant) and then constructed counts of the number of posts containing the term on each day between its first introduction to the end of the period of analysis. Given the relatively low frequency of usage on the BitcoinTalk Economics board, I omitted it from the main analysis. As the changetip bot was not able to be used on the platforms used to host the BitcoinTalk forums, I was only able to consider its usage in the r/Bitcoin corpus For this part of the analysis, I applied regular expressions to the full, uncleaned r/Bitcoin corpus in order to extract posts containing the specific html code used to call the changetip bot and then constructed daily counts of the number of posts containing at least one of said calls.

Tables

r/Bitcoin – Key Topics		
Topic Number	**Topic Label**	**Top 15 Words Associated with Topic (FREX)**
9	Mass Adoption	adopt, will, early, smart, become, mass, future, see, crypto, many, eventual, altcoin, we, alt, popular
12	Merchant Adoption	card, merchant, bitpay, amazon, gift, service, shop, credit, accept, chargeback, visa, discount, payment, retail, debit
14	Central Banking	debt, loan, reserve, lend, borrow, fed, wealth, inflation, bond, monetary, economic, air, banker, deflatation, Greece
17	Metallism	intrinsic, gold, silver, commodity, metal, value, utility, valuable, unit, divisible, medium, worthless, scarcity precious, scarce

Table 1: Top words (by FREX value) associated with key topics identified in r/Bitcoin corpus. Word stems have been replaced with commonly occurring full words associated with them.

BitcoinTalk: 'Economics' Board – Key Topics		
Topic Number	**Topic Label**	**Top 15 Words Associated with Topic (FREX)**
6	Anti-Government	law, monopoly, enforce, rule, force, violence, land, freedom, libertarian, free, regulate, criminal, corporate, organization, voluntary
7	Central Banking	bank, loan, deposit, reserve, lend, fed, borrow, print, federal, debt, central, fraction, bond, credit, lender
8	Austrian/Argument	argument, theory, logic, argue, view, Austrian, word, understand, definite, disagree, define, science, concept, economist, rational
10	Adoption	adopt, bitcoin, early, will, crypto, future, accept, million, won't, become, reach, worth, people, mainstream, stable
11	Metallism	gold, silver, intrinsic, value, metal, commodity, medium, currency, store, digit, valuable, paper, unit, fiat, precious

Table 2: Top words (by FREX value) associated with key topics identified in BitcoinTalk: 'Economics' corpus. Word stems have been replaced with commonly occurring full words associated with them.

BitcoinTalk: 'Speculation' Board – Key Topics		
Topic Number	**Topic Label**	**Top 15 Words Associated with Topic (FREX)**
7	Adoption	adopt, year, grow, speculation, bitcoin, growth, halving, early, cap, increase, mainstream, stable, will, hype, eventual
12	Metallism	gold, silver, physic, commodity, etf, asset, stock, metal, natural, measure, apply, share, approve, precious, monetary

Table 3: Top words (by FREX value) associated with key topics identified in BitcoinTalk: 'Speculation' corpus. Stems have been replaced with commonly occurring words associated with them.

r/Bitcoin – Additional Topics	
Topic Number	**Top 15 Words Associated with Topic (FREX)**
1	hes, guy, didnt, lost, uhe, gambl, wasnt, got, buck, knew, crazi, dumb, damn, lol, ass
2	key, wallet, password, encrypt, cold, app, offlin, backup, privat, storag, phone, hack, seed, googl, blockchaininfo
3	rise, price, specul, bubbl, stabl, volatil, stabil, valuat, fluctuat, cap, increas, drop, hoard, predict, growth
4	wire, deposit, account, withdraw, union, bitstamp, insur, coinbas, atm, dwolla, escrow, localbitcoin, transfer, mtgox, circl
5	sign, address, track, messag, receiv, list, send, sent, user, ident, channel, add, mix, balanc, automat
6	btc, sell, buy, usd, coin, buyer, sold, convert, seller, bid, immedi, uright, purchas, cheaper, moment
7	decentr, digit, altern, rippl, cryptocurr, system, token, technolog, built, tradit, applic, invent, aspect, innov, distribut
8	week, day, wait, hour, refund, site, friend, notic, gave, contact, ticket, scammer, uiv, screw, yesterday
10	life, kid, live, job, rich, hate, school, man, fuck, deserv, god, kill, greedi, troll, student
11	donat, post, tip, read, reddit, answer, comment, video, question, thread, chariti, thank, explain, subreddit, articl
13	dont, theyr, your, cant, uyeah, uand, uwel, uwhi, uthey, wouldnt, uhow, money, udo, that, just
15	foundat, media, project, launch, announc, communiti, board, focus, ceo, develop, group, bring, itus, welcom, team
16	invest, bet, scheme, lose, ponzi, afford, upeopl, loos, pump, put, dump, chanc, sit, itll, riski
18	worth, dollar, incom, gain, car, million, hous, net, penni, save, hold, spend, earn, billion, less
19	block, chain, hash, miner, node, fork, reward, attack, pool, size, network, electr, energi, incent, transact
20	profit, litecoin, asic, chip, bfl, run, cheap, gpu, player, rig, equip, roi, manufactur, hardwar, turn
21	law, launder, legal, illeg, regul, drug, crimin, crime, licens, court, polic, ban, transmitt, lawyer, state
22	sourc, simpl, ownership, color, design, difficult, entri, specif, complex, technic, complic, open, easili, cryptographi, imposs
23	vote, perhap, perfect, common, flaw, vast, decis, certain, particular, failur, condit, mere, social, surviv, behavior
24	argument, wrong, matter, point, fact, understand, doesnt, reason, absolut, true, logic, isnt, uthi, obvious,
25	trade, trader, gox, stock, chines, china, wall, investor, hedg, arbitrag, liquid, risk, strategi, exchang, share

Table 1A: Top words (by FREX value) associated with key topics identified in r/Bitcoin corpus.

BitcoinTalk: 'Economics' Board – Additional Topics	
Topic Number	**Top 15 Words Associated with Topic (FREX)**
1	sell, dump, btc, mtgox, gox, sold, buyer, trader, bought, buy, volatil, price, seller, volum, specul
2	mine, miner, block, difficulti, network, transact, hash, asic, blockchain, wallet, fee, hardwar, chain, satoshi, reward
3	next, ago, year, last, now, around, bubbl, crash, week, big, news, look, bet, late, hope
4	invest, card, risk, busi, gambl, compani, earn, option, payment, save, retir, pay, paypal, cash, gain
5	deflat, inflat, suppli, rate, deflationari, demand, hoard, increas, growth, consumpt, consum, decreas, caus, product, economi
9	technolog, model, develop, data, energi, earth, scale, innov, advanc, project, design, effici, mass, gas, resourc
12	poor, rich, job, worker, live, famili, class, life, employ, educ, labor, food, skill, kid, robot
13	week, day, wait, hour, refund, site, friend, notic, gave, contact, ticket, scammer, uiv, screw, yesterday
10	life, kid, live, job, rich, hate, school, man, fuck, deserv, god, kill, greedi, troll, student
11	donat, post, tip, read, reddit, answer, comment, video, question, thread, chariti, thank, explain, subreddit, articl
13	post, thread, articl, link, read, thank, forum, topic, pleas, ive, comment, name, list, anonym, page
14	china, greec, europ, euro, countri, greek, russia, european, germani, usa, export, russian, japan, chines, america
15	know, realli, dont, guy, just, scam, friend, wouldnt, lol, that, your, sure, like, serious, theyr

Table 2A: Top words (by FREX value) associated with key topics identified in BitcoinTalk: 'Economics' corpus.

Applied Categories and Subcategories	
Austrian and Right-Wing Economics	
	Metallism
	Deflation/Inflation
	Improvement over gold
	Fed Reserve/Central Bank
	Anti-government/Fiat
	Intrinsic Value
	Destabilized national currencies
	Third Parties/Centralization
	Free Market
	Intrinsic Value
Other Economics	
	Labor Theory of Value
	Traditional Definition of Money
	Subjective Value
Social	
	Exchangeability
	Network Effects
	Conventionalist/Constructionist
	Adoption
	Confidence/Trust
	Credit/Debt/Claim
	Social Movement/Community
Investment	
	Speculation
	Storing/Hoarding
	Practical Strategy and Advice
	Prediction
	Price Movements
Misc.	
	Other
	Unrelated
	Unsure

Table 3A: Categories and subcategories applied in hand-coding of randomly sampled posts from each the r/Bitcoin and BitcoinTalk.org "Economics" corpora.

BitcoinTalk: 'Speculation' Board – Additional Topics	
Topic Number	**Top 15 Words Associated with Topic (FREX)**
1	withdraw, mtgox, gox, btc-e, bitcoinica, bitstamp, arbitrag, deposit, btcchina, leverag, exchang, trade, okcoin, wire, chines
2	wave, resist, downtrend, bullish, revers, bearish, break, bottom, ath, trend, consolid, triangl, sideway, downward, peak
3	news, weekend, coinexplan, gonna, wake, cat, choo, sleep, moon, rocket, train, readi, sub, christma, morn
4	wall, bid, manipul, whale, auction, depth, dump, order, book, pull, buyer, finex, squeez, seller, eaten
5	chain, sidechain, hash, fork, blockchain, network, node, asic, pool, dev, rippl, protocol, code, hardwar, miner
6	feel, dream, felt, amaz, ive, ball, though, meme, pretti, cool, chicken, bit, great, gif, horribl
8	graph, explan, predict, log, red, hour, border, green, ago, chart, draw, linear, utc, analysi, date
9	troll, thread, hes, pleas, forum, delet, ignor, page, bitcointalk, retard, titl, repli, joke, fonzi,
10	ltc, btc, bitpay, paypal, million, discount, per, ebay, btcs, purchas, convert, usd, worth, mbtc, total
11	lose, bet, win, game, invest, gambl, strategi, make, smart, rich, lost, ponzi, afford, decis, money
13	countri, govern, tax, debt, russia, legal, war, greec, american, crimin, illeg, fed, usa, citizen, freedom
14	sold, bought, cheap, buy, sell, panic, coin, hodl, goe, stash, drop, buck, hold, bag, regret
15	opinion, answer, poll, question, hear, blah, speak, vote, understand, expert, evid, word, heard, fact, intellig

Table 4A: Top words (by FREX value) associated with key topics identified in BitcoinTalk: 'Speculation' corpus.

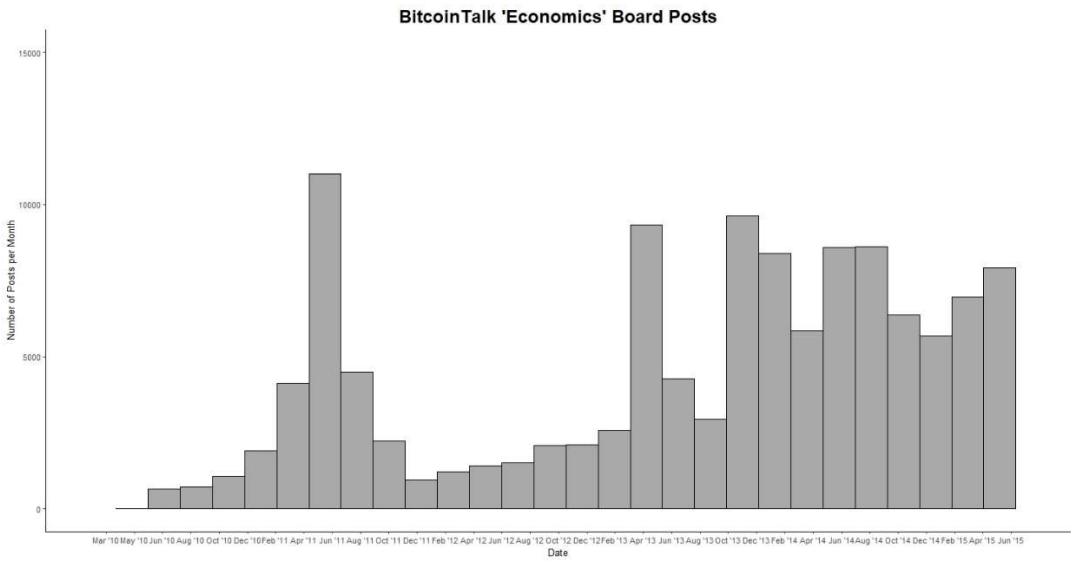

Figure 1

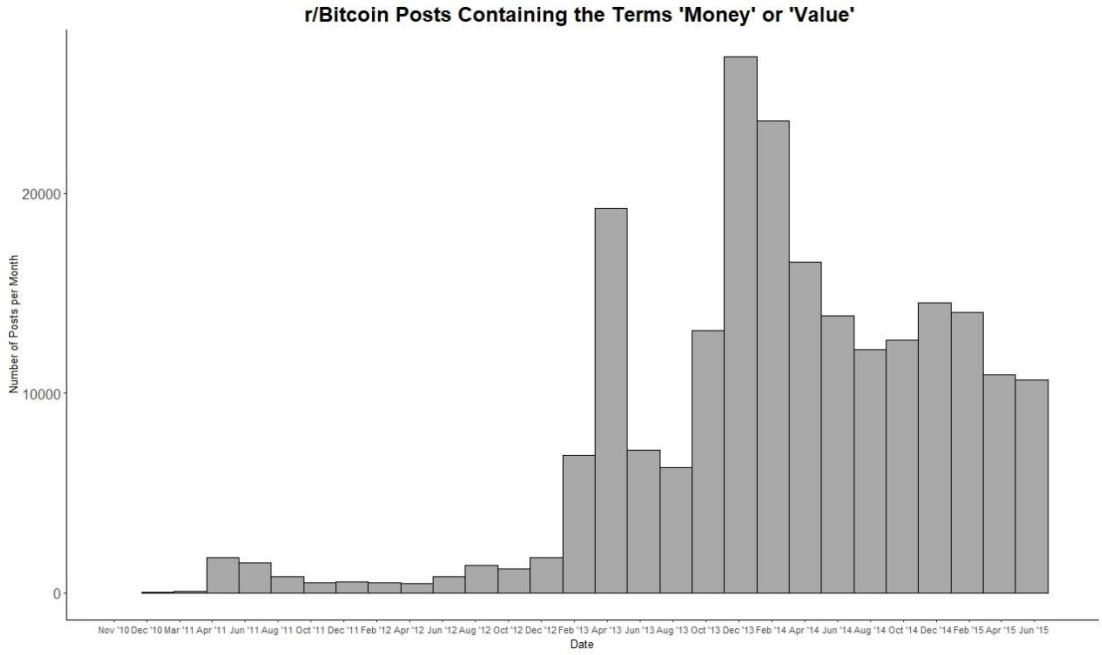

Figure 2

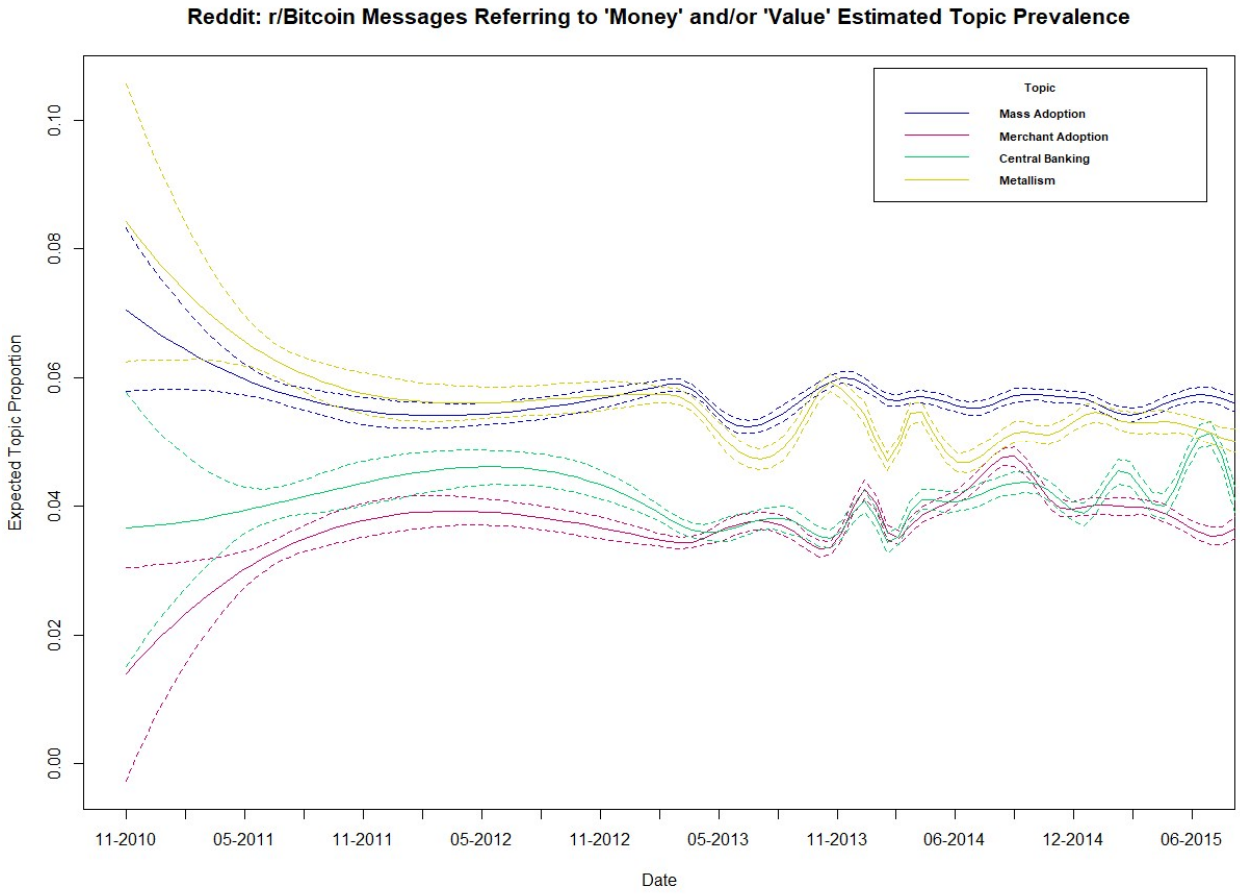
Reddit: r/Bitcoin Messages Referring to 'Money' and/or 'Value' Estimated Topic Prevalence
Topic
Mass Adoption
Merchant Adoption
Central Banking
Metallism
Expected Topic Proportion
0.00
0.02
0.04
0.06
0.08
0.10
11-2010
05-2011
11-2011
05-2012
11-2012
05-2013
11-2013
06-2014
12-2014
06-2015
Date

Figure 3

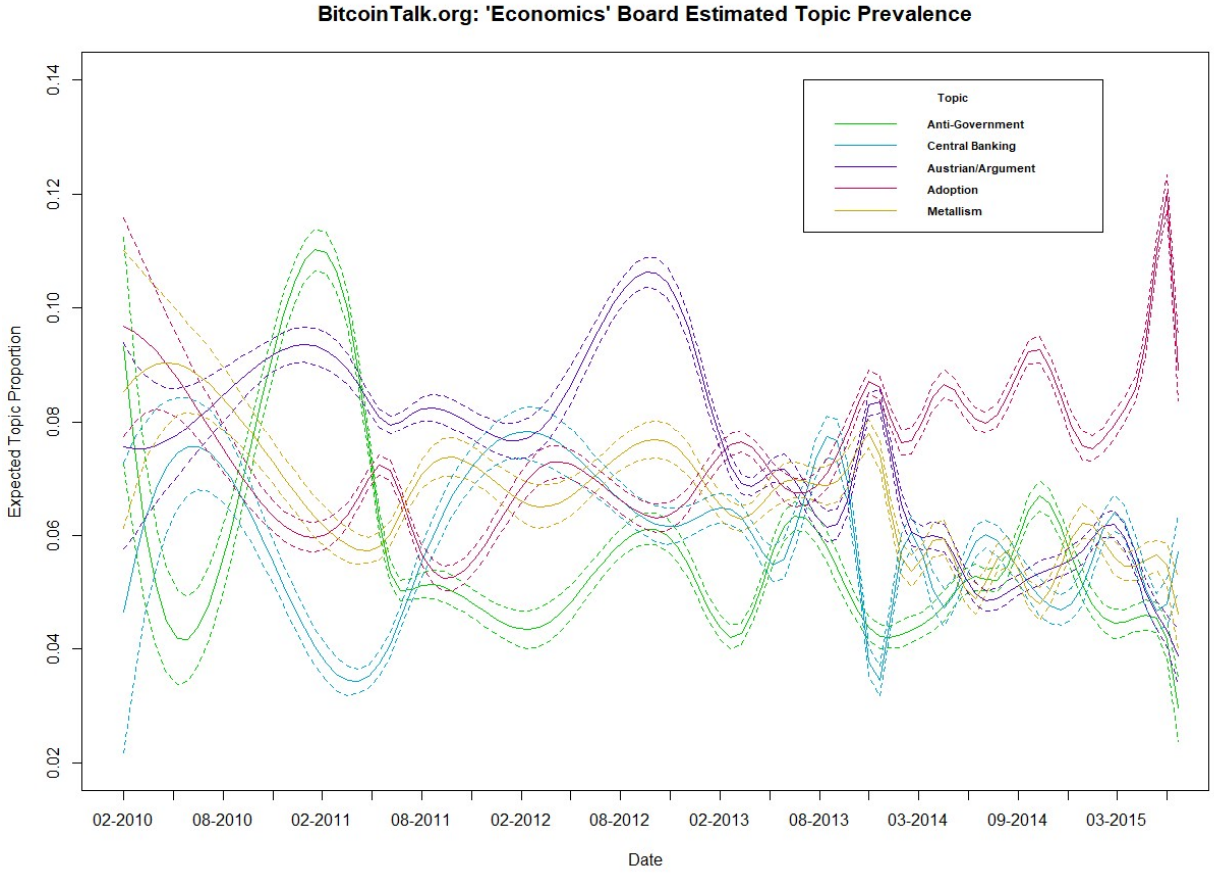
BitcoinTalk.org: 'Economics' Board Estimated Topic Prevalence
Topic
Anti-Government
Central Banking
Austrian/Argument
Adoption
Metallism
Expected Topic Proportion
0.02
0.04
0.06
0.08
0.10
0.12
0.14
02-2010
08-2010
02-2011
08-2011
02-2012
08-2012
02-2013
08-2013
03-2014
09-2014
03-2015
Date

Figure 4

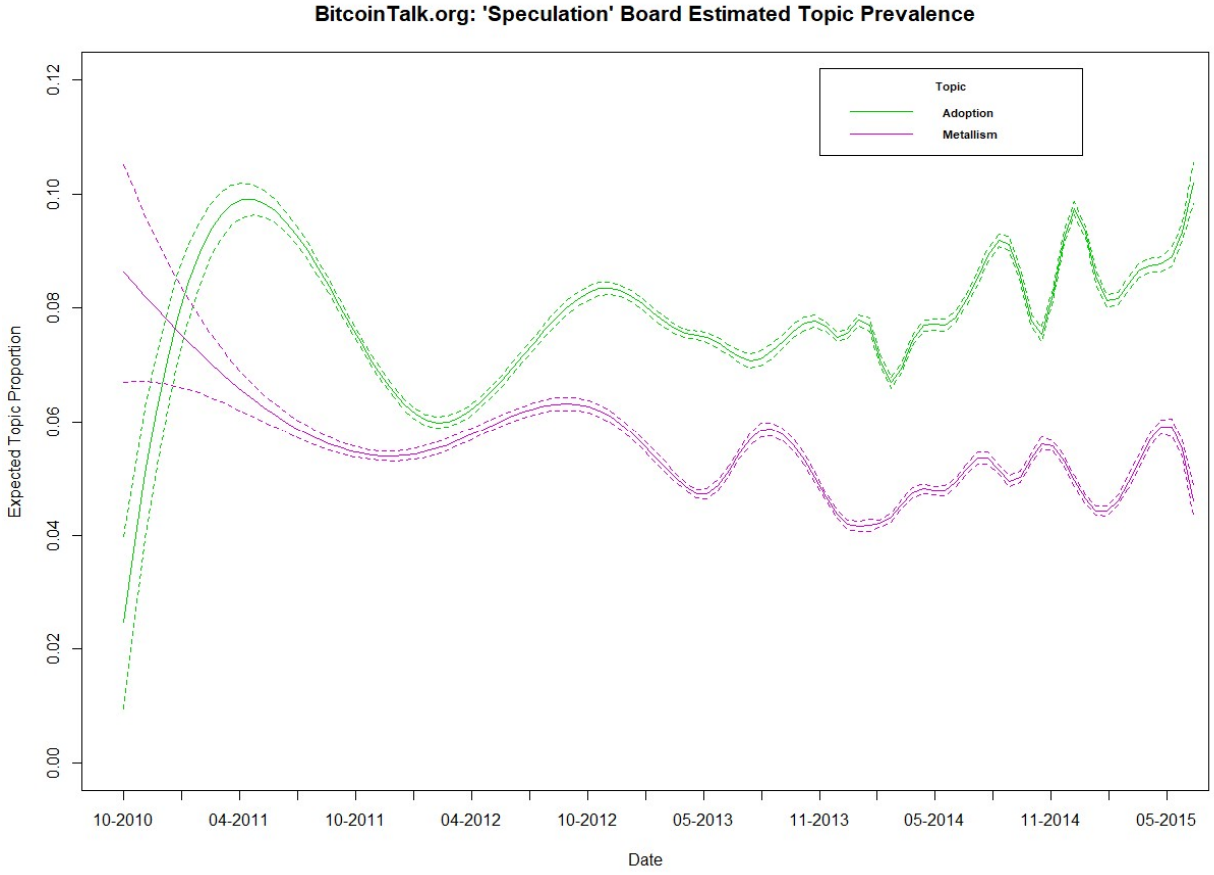
BitcoinTalk.org: 'Speculation' Board Estimated Topic Prevalence
Topic
Adoption
Metallism
Expected Topic Proportion
0.00
0.02
0.04
0.06
0.08
0.10
0.12
10-2010
04-2011
10-2011
04-2012
10-2012
05-2013
11-2013
05-2014
11-2014
05-2015
Date

Figure 5

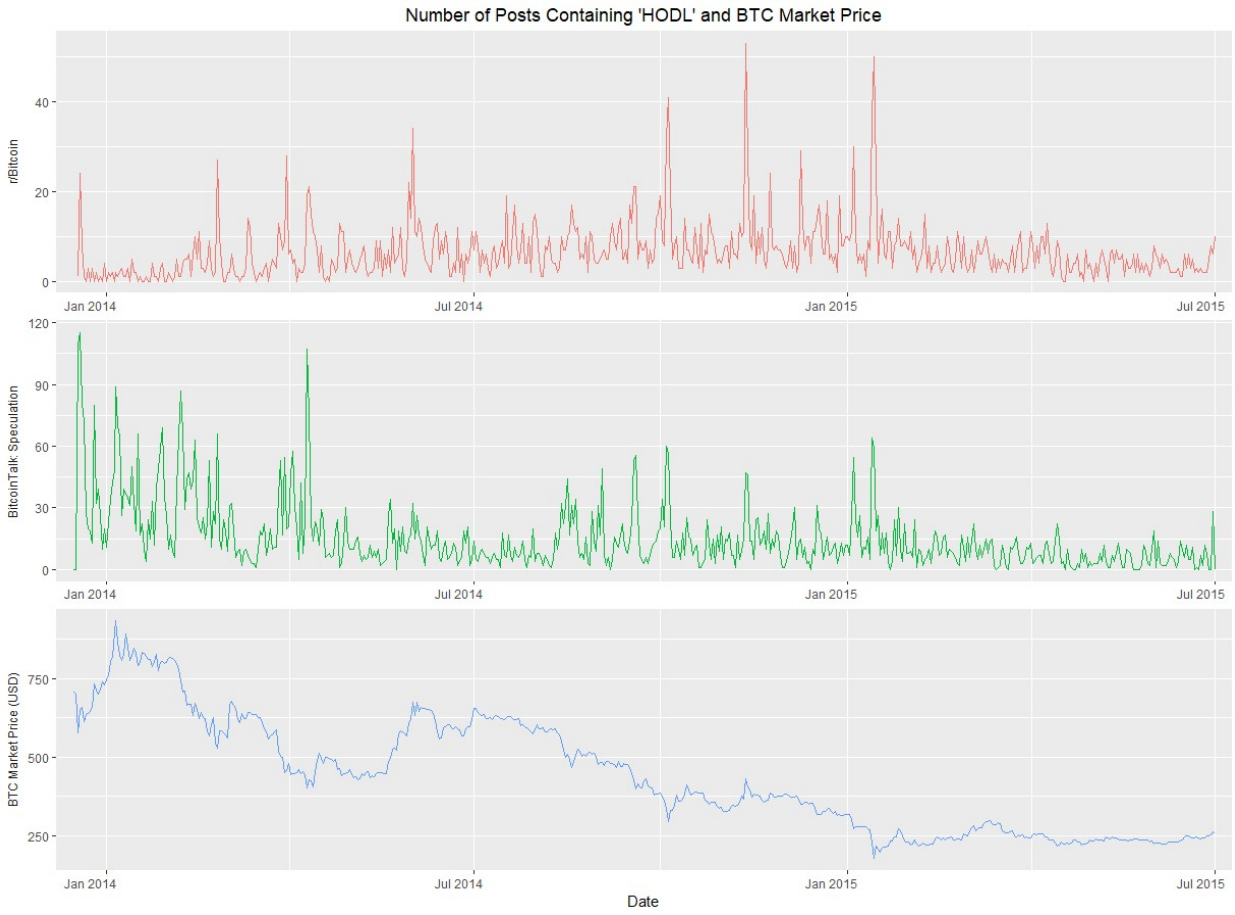
Number of Posts Containing 'HODL' and BTC Market Price
r/Bitcoin
40
20
0
Jan 2014
Jul 2014
Jan 2015
Jul 2015
BitcoinTalk: Speculation
120
90
60
30
0
Jan 2014
Jul 2014
Jan 2015
Jul 2015
BTC Market Price (USD)
750
500
250
Jan 2014
Jul 2014
Jan 2015
Jul 2015
Date

Figure 6

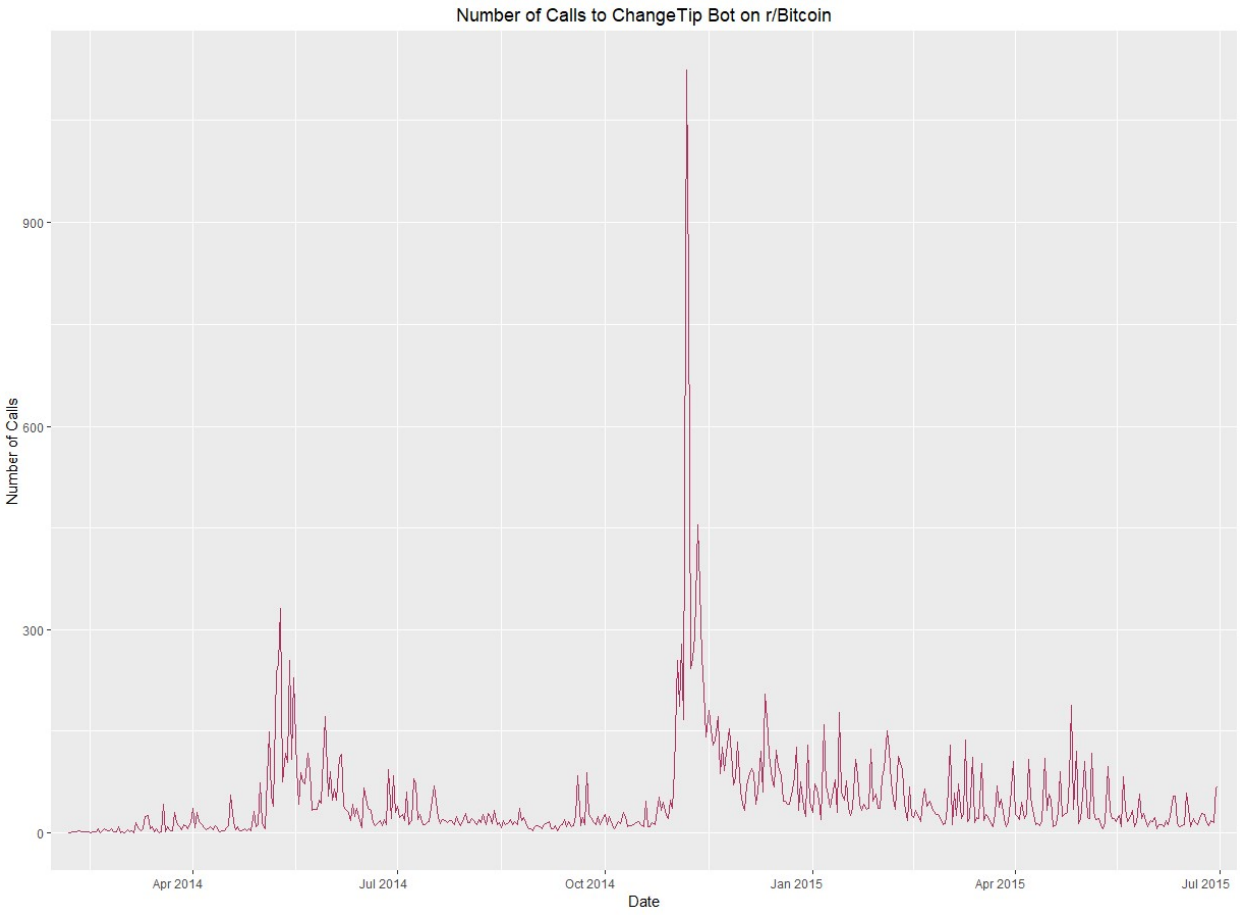
Number of Calls to ChangeTip Bot on r/Bitcoin
Number of Calls
900
600
300
0
Apr 2014
Jul 2014
Oct 2014
Jan 2015
Apr 2015
Jul 2015
Date

Figure 7