Re-risking in Realtime
## On Possible Futures for Finance after the Blockchain

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Abstract:

Contemporary financial technology ("fintech") efforts to enhance the clearance and settlement of transactions may reopen of long-settled questions about accounting, its role in the development of capitalism, its theological undertones, and its practical efficacy. This essay considers distributed ledger technology, the database systems underlying Bitcoin and similar digital currency experiments. Distributed ledgers do more than record transactions. They can also verify them without apparent human intercession, and they can execute more complicated tasks that take on the appearance of and have some of the same practical effects as contracts. If double-entry bookkeeping animated the modern constitution of subjects and objects of property, what do distributed ledgers herald?

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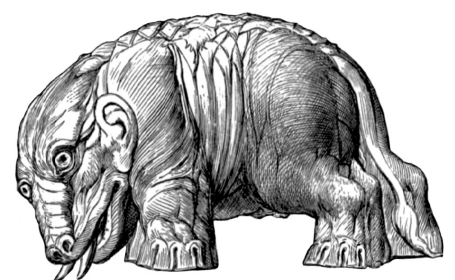
July, 2015. I am in a fancy conference facility in midtown Manhattan, New York City, with a group of about 200 others here to participate in a workshop on digital currencies and the blockchain. I scan the room: generationally mixed, mostly men. But with my eye on the Twitter feed for this event I notice the comment, "I always count the number of women at these things but at this one I stopped counting." Apparently the approximately 20% female attendance was impressive to this observer.

Sponsored by a prominent American finance publication, the event promised to showcase the new possibilities of, and significant investments in, blockchain-based systems. The database that makes the Bitcoin system run, a blockchain is a digital ledger that exists on all nodes in the Bitcoin network or the network of a similarly structured digital currency system. In such systems there is no one point of control or one central records-keeper. Instead, the ledger is updated across all the participating nodes after transactions are posted to the network and verified through a computational competition among participants. The ledger is thus both decentralized and distributed, two core characteristics of blockchain systems. To advocates, this means that the system obviates "trust". There is no need for a trusted third-party either to warrant transactions or to maintain records. The distributed nature of the system also adds resilience: if some nodes go dark, the fact that the ledger exists on all the other nodes means that transactions cannot be lost. The computational competition for verifying transactions, in turn, reduces the likelihood of false transactions being accepted by the network to near zero: a consensus of nodes has to agree that a transaction is true for it to be written into the simultaneously updated copies of the ledger across the network. For their promoters, blockchain systems thus promise a persistent, verifiable, time-stamped and public record of transactions without there having to be any third-party auditor or regulator, or any "trust" at all, save trust in the system and the code undergirding it.

Bitcoin is the brainchild of an anonymous programmer or programmers who penned a whitepaper under the name Satoshi Nakamoto on the design of a digital currency (Nakamoto 2008; see Clark 2013). As others have discussed, the commitment to decentralization at the core of Bitcoin derives both from a skepticism or hostility to states and banks along with the transformation of the Internet's own nature as a distributed network into an ideology (see Dodd 2015, Brunton 2015). Bitcoin as a currency attracted the attention and interest of a whole range of early adopters, from anti-government activists to hackers and digital goldbugs attached to the idea that money has to be backed by something real and immutable in order to have value, in this case, the code or the mathematics behind it (see Maurer et al. 2015, Ferry 2016).

So what were investment bankers in Manhattan doing talking about the blockchain? [1]

Lana Swartz (forthcoming) delineates the "blockchain dreams" of different types of techno-economic actors experimenting with this technology. For some, radicals who espouse a future of open, decentralized systems, the blockchain heralds a world of autonomous computational agents liberating humanity from drudgery. For others, "incorporative" proponents of the blockchain,

[1] There is grammatical indeterminacy around Bitcoin and the blockchain. I adopt the emerging convention that capitalizes Bitcoin when referring to the infrastructure and network, and uses the lowercase when referring to the currency unit (bitcoin). There is not yet a convention around the use of the term blockchain. I employ the definite article when referring to blockchain systems in the abstract or the Bitcoin blockchain ("the blockchain") but tend to prefer the use of the term blockchain as an adjective ("blockchain systems"). My usage contrasts with others who simple employ "blockchain" without the use of an article. I also adopt the preposition "in" to describe data recorded by blockchain systems, as opposed to "on" ("put it in the blockchain" versus "put it on the blockchain") because the data structure of the blockchain itself is constituted by the units or entries entered "into" it, rather than being externalizable once placed "onto" it. When quoting from others, however, I retain their conventions.

the technology can be laminated on the existing financial infrastructure to solve record keeping and transaction settlement problems—hardly a world-transforming vision.

Or is it? Accounting has remade the world before, after all. **[2]** And there may be deep continuities between the dreams of financial industry actors and their forebears in other transformational moments in the history of capitalism. Based on research that is ongoing at the time of this writing (July 2016), I argue that finance industry interest in the blockchain reanimates dreams of what finance can do with accounting. I pay particular attention to finance professionals whose careers spanned the global financial crisis, the period beginning 2007 when the failures in the US mortgage market cascaded throughout Wall Street investment banks and soon caused economic chaos in much of the world. Having had their entire industry shaken, these professionals are looking to the blockchain with a specific set of problems in mind. They are also seeking new ways to generate revenue on the heels of not just the GFC but broader shifts in finance. Their perspective is distinct from that of the often younger programmers and innovators who started experimenting with Bitcoin and blockchain systems after the initial burst of media attention given to the phenomenon.

This essay also explores interest in the blockchain in light of what Bruno Latour (1993) has termed the modern settlement. Latour uses the phrase to describe the philosophical and pragmatic separation of subjects from objects, humans from nature, and the denial of their co-constituted, networked and always intertwined becomings. The modern settlement was, as the name implies, an accounts-keeping, with some things being moved over into the "human" column and others into the "nature" column. As I argue below, it was central to other forms of accounts-keeping, too, allowing certain relations to be imagined as among some humans with respect to things (the classic liberal definition of property) while allowing other humans to be rendered the stuff of nature: objects, not subjects, of law. The blockchain presents an opportunity for unsettling this settlement. For Swartz's radicals, new actors may enter the assembly of human and non-human agents. For finance professionals, the blockchain may permit new ways to clear and settle transactions, simultaneously reopening and foreclosing this modern settlement. Why this is relevant to a new technology of accounting—and what it has to do with past ones—will hopefully become apparent.

A word of caution: it is unclear what, if anything, will actually happen in the "distributed ledger space", as many investors have come to call this area of potential business opportunities. The numbers in terms of investment capital flowing into blockchain-based financial technology are modest: investments in blockchain-based startups increased to US$474 million in 2015, up from only $3 million in 2011 (Maras 2016). This may sound impressive, but consider that investment in the so-called on-demand or sharing economy in 2015 was over US$3 billion (down from over $4 billion in 2016; CB Insights 2016). Nevertheless, a noteworthy set of people and businesses are jumping into the distributed ledger space. R3, a blockchain technology company launched in 2014, attracted some big name supporters—including Visa founder, Dee

[2] There is a long and venerable line of scholarship in the humanities and social sciences about the causes and consequences of changes in accounting practice. For further reading: Mattessich's (2000) series of essays documents world-changing shifts in the ancient world; Poovey (1998) will take the reader up through the modern period.

Hock—and has developed into a consortium of over 40 banks and financial institutions, ranging from Barclays to Goldman Sachs and Deutsche Bank. NASDAQ released a blockchain-based trading infrastructure in 2016 (del Castillo 2016). And Blythe Masters, formerly of JP Morgan Chase, whose claim to fame had been the development of credit default swaps before the financial crisis, took the helm of Digital Asset Holdings, a blockchain ledger services company, in 2015. What began as an experiment in digital currency by programmers, technolibertarians and cryptographers had, by 2015, gained traction on Wall Street and the City of London. This interest is striking also because it is a relatively dull feature of blockchain systems that is garnering so much excitement: it is not the blockchain's potential for unleashing a world of non-state, anonymous, digital currencies. It is, rather, its ability to keep track of things. To function as an accounts-book. To act like a digital notary. Part of the puzzle then is why this is so compelling to financial services professionals, at this point in time. Like latter-day Luca Paciolis, **[3]** these professionals are rediscovering the wonders of accounting. And imagining that it will do equally wondrous things.

What happens after a trade? One settles accounts—reconciling what is owed to whom and ensuring value transfer is complete. When you redeem a note, for instance, you get the value for which you paid and the transaction is settled. When that happens, like the woman tweeting about the gender distribution in the conference room, you stop counting, at least until the next transaction. Or, as in a confessional, after you recount your sins, the slate is wiped clean.

Accounting and Automaticity

"There will be totally automated, self-replicating cars", Self-*driving* cars, I asked? No, self-replicating: when they break down or need parts, they will fix themselves, and when they need to be replaced, they will make new cars. I was speaking to a young programmer who had just left behind a blockchain-based business after getting bought out by a financial services firm. A real dreamer, he was considering his next move, and speculating on whether he wanted to return to college to complete his degree, or launch a new business. Something that would marry blockchain systems with 3D printing and would permit humanless assembly. I have to admit I didn't quite understand how a distributed ledger would benefit machine-led, automated construction. He shifted to another example: ice cream shops, which "self-replicate and own themselves... you could get rid of the cashier, too." But who will stock the shelves, I asked? "I guess robots could do that, too."

As the historian James Aho has provocatively argued, the institution of double-entry bookkeeping in late medieval and early modern Europe owed more to changing interpretations and practices around the Catholic sacrament of confession than merchants' drive to plan rationally and in calculative fashion for their business futures. Adopting a quasi-therapeutic practice from the Hindus or ancient Greeks, the penitent in conversation with the ordained sought to create a narrative of his moral progress (Aho 2005, 35). Aho also

[3] Luca Pacioli (c.1447-1517) was a Florentine Franciscan mathematician and is widely regarded as the founder of the double-entry bookkeeping system of accounting. He also devised a fantastic method of dactylonomy, that is, a system for doing sums using the digits of the fingers (see Maurer 2010).

shows how Pacioli, considered the founding father of double-entry, derived some of his prescriptions for the creation of ledgers from Cicero's rhetoric, which outlined the moral training of the orator—or, for Pacioli, the auditor.

Analogously, visions like those of my young informant have as much to do with aspirations of moral uplift than actual business plans or value propositions for the consumer. For this informant, the possibility of the blockchain resides in its ability to manage and maintain—indefinitely—distributed networks of automobiles or ice cream parlors without human intercession. This will presumably free humans for more important matters, for self-development and self-improvement: for the things that really count, one might say. This informant's dream of automation was tied to the enablement of human flourishing. Self-replicating cars and shops will relieve us from drudgery and, indeed, from the need to labor. It is a vision resonant with ancient and Renaissance notions of civic humanism: the privilege and duty afforded free men of property to cultivate the virtuous life (Pocock 1975). It is not clear how these humans will pay for their self-replicating cars or ice cream, but perhaps money is beside the point: a world of automatically regenerating material things and the robotic manservants who create them is a world of abundance, a perpetual jubilee. **[4]**

For those in high finance, blockchain ledgers can perform another kind of moral uplift. "Blockchain could make the world a better place", proclaimed one participant in the Manhattan gathering. He went on to narrate a morality tale I had heard with increasing frequency among blockchain promoters as well as more neutral observers of the Bitcoin phenomenon: if mortgages and liens were recorded in a permanent, immutable, distributed ledger like the blockchain, the financial crisis might have "played out differently", as one informant put it. Said another participant in the Manhattan workshop, publically, "It's still a very high friction process to get a mortgage, transfer land title or get title insurance. Is it the most efficient way we have given the technology we have, and the answer is no, given that we have the [ability to] share this information in a time-stamped way" in the blockchain.

This possibility of recording mortgages and liens in the blockchain lends a redemptive character to this technology—figuratively and literally. Said a law professor with only the most cursory knowledge about Bitcoin and the blockchain, a year earlier at a forum at UC Irvine, "if we had a system like this during the mortgage crisis, no one would have had to go around asking, 'who holds the note'", that is, which financial entity was responsible for which (pieces of) home mortgages gone bad. He was echoed at the Manhattan conference: "What created the systemic issue [in the mortgage crisis] was it was difficult to trace title of all the assets that you own."

Paul Langley (2008) documented at the beginning of the financial crisis how mechanisms of credit scoring, credit reporting and sorting of borrowers permitted the securitization of home mortgages into risk-structured financial instruments. The subprime lending boom distributed and generalized risk for homeowners and investors alike through complex instruments like collateralized debt obligations and credit default swaps. The calculative, legal and logistical limits of these new financial instruments confounded even

[4] On all the things that can go wrong once we achieve this state of artificially intelligenced machinic production, see the science fiction novelist Charles Stross's (2004) Singularity Sky. On the utopian vision, see, perhaps, the universe of Star Trek (Saadia 2016).

their inventors, much less regulators and the media in the aftermath of their failure. After the financial crisis, banks in general went through a process of de-risking. Their regulators required higher capital on hand. Their managers were concerned with ongoing reputational risk after "too big to fail" institutions received government support while everyday citizens faced austerity.

Those industry professionals who lived through and had to deal with the aftermath of the crisis have a unique perspective on risk and de-risking as they approach the blockchain. First, they worry about branding: as many informants have recounted to me, the word "Bitcoin" scares management. Some of the more experimental and curious might entertain a Powerpoint presentation by a visiting academic, hosted by their edgier employees. But for most, the term itself carries too many associations with criminality, money laundering, and scandal. People say both seriously and tongue in cheek that the solution is to replace the word "Bitcoin" with "blockchain" or, even better, "distributed ledger" in one's presentations. The second kind of de-risking is promised by the blockchain code itself. A permanent, immutable, time-stamped, distributed ledger held by all counterparties to a set of transactions is believed to underwrite certainty in property, identity and time. Once a transaction is verified and recorded, it cannot be altered. It enters into the publically visible database of all transactions, it is time-stamped, and time in the blockchain is irreversible: it is a chronology, one thing after another, without the possibility of looping back and changing the details of the past, as one might be able to do in some domains of equity like inheritance. New transactions are added onto the old ones, sequentially. In addition, although the actual names or addresses of transacting parties are in principle inaccessible, the public digital address of every transactor is visible in the blockchain. If we participate in a distributed ledger system, we know, at all times, who owns what, at least in terms of that public address. If we carve up those assets represented in the blockchain into a million little pieces and reassemble them into new packages demarcated by level of risk, the fact that these operations have been recorded in the blockchain creates a permanent audit trail. No one needs track down the note or reconstruct transfers of ownership. Everything is in the blockchain.

Building on this basic model—of a distributed ledger, a secure, permanent, immutable electronic audit trail—finance industry professionals propose a range of uses for blockchain systems all aimed at replacing existing electronic and paper-based record keeping systems with a blockchain system. Most corporate activity is around "private" or "permissioned" blockchain systems. Unlike the Bitcoin blockchain, these are not open to all-comers but rather maintained by a small set of regularly transacting parties (banks and investment firms, for example). Goldman Sachs (2016) outlines six potential use cases, including "reducing transaction costs in real estate title insurance" and facilitating leveraged loan trading. To take the real estate example, Goldman Sachs writes, "Property records validated by consensus [in a distributed ledger] help eliminate paper-based errors. Blockchain could make paper-based records obsolete, as all present and past real estate transactions would be meticulously stored on an immutable and decentralized ledger. Importantly, no disagreement as to

the ledger's integrity would arise because the network relies on consensus." (Goldman Sachs 2016, 36) **[5]**

Reducing error, improving efficiency, and eliminating transactional risk: these are the promises of the blockchain. Writing for the European Central Bank, Pinna and Ruttenberg (2016) similarly view blockchain systems as a further step in the evolution of securities trading, allowing even for automatic transactions to, say, "optimiz[e] the use of collateral to take place in the ledger in response to a specific corporate action or market event." (Pinna/ Ruttenberg 2016, 18, punctuation removed) For example, in a derivatives trade which requires collateral to be posted (for regulatory and risk-management reasons), a trader might have any number of assets that could serve the collateral function. Market conditions like interest rates might make one of these assets more attractive than another for this purpose, given that when an asset is held as collateral, it cannot be traded. A key variable, therefore, in deciding what to use as collateral is how long a trade is expected to clear. Furthermore, there are costs to using a specific asset as collateral beyond its being tied up for the period of time before the trade settles. A range of intermediaries manage collateralization and do not do so for free. Pinna and Ruttenberg thus acknowledge that, would such a system to be actualized, "some financial intermediaries such as custodians could … see their role disappearing." (4) Still, as, Goldman notes for the case of real estate title, "we recognize that entering and reconciling property data into any blockchain will require human intervention." (36)

Such caution was not so evident at the Manhattan conference: "You can fire your IT team!" said one participant in an unscripted moment. On the other hand, said another, "if you did your PhD in math, finally your day has come", referencing the employment opportunities for those with training in advanced cryptography. The implications for how business is conducted on Wall Street were not far from the minds of many at this conference or among my other informants involved in thinking about blockchain systems for finance. These visions are therefore not so removed from automatically self-stocking and reproducing ice cream parlors. Electronic accounting, by means of a collectively maintained and verified database without any third-party intermediary, promises permanent and true record keeping that could eliminate many back-office operations and currently existing digital or paper-based data storage systems. The multiple existing non-interoperable systems currently used by banks and financial firms could be merged into one, albeit this one is itself decentralized: it does not have a central control point but is instead a distributed network of entities—even if behind a private or permissioned wall—all working to create a digital consensus of transactional veracity.

Re-risking

The promise of the blockchain is not simply in creating efficiencies by streamlining the back office. There is a bolder dream. To understand it, however, we need to appreciate shifts in banking and financial services more broadly that have been unfolding since before the financial crisis.

[5] Instances where disagreement has occurred due to fraud and other problems have resulted in all-too-human intervention, to figure out where transactions may have been duplicated or "forks" in the blockchain have developed, and to re-set things. A dramatic case is the hack of the DAO system, in which the creators of the Ethereum blockchain on which DAO was based had to intervene directly. See O'Connell 2016.

The popular understanding is that banks make money by lending at interest. However, since the 1980s, the proportion of bank income from sources other than lending has increased, from 25% in 1984 to 43% in 2001 (Stiroh 2004), and has remained around 40% of US banks' net operating revenue ever since (see for example FDIC 2016). Non-interest income comes primarily from fees: overdraft fees, transaction fees, interchange fees, ATM fees, check fees, annual fees on accounts or inactivity fees, among others. The rise in fee revenue is associated with diminished returns from lending as well as simply banks' effort to secure new revenue streams that are insulated from broader economic forces or shocks.

Since the global financial crisis many displaced financial services professionals found themselves migrating into fee-based areas such as the payments industry. As I have discussed elsewhere (Maurer 2012), the payments industry—the business of processing electronic value transfer, as with credit and debit card transactions—is an odd beast: central to much of contemporary capitalist economic activity, its own structuring logics sit to one side of capitalism itself. If capital is defined by its self-expanding nature (money makes more money), payment is defined by its facilitation of the movement of that money from one economic actor to another without decay or enhancement. When I send you $10, you expect to receive $10, no more and no less. Payment is about transmission, not transformation. At the same time, however, someone has to pay for payment, and the payments industry runs on transaction fees (so the $10 you receive may be more like $9.98).

Fees themselves are difficult to parse in critical or mainstream economic theory. Are they rents, or prices? If they are prices, what are they the prices of? Contemporary critics of capitalism of various persuasions have argued that the period since the global financial crisis is increasingly characterized by rents, fees and revenue derived from licenses or patents more than industrial production, or that we are in a period of "cognitive capitalism" where intellectual has finally subsumed manual labour. Things like licenses for software guarantee to their owners an eternal annuity, a continuous revenue stream delinked from the material stuff of the computers they run on, or so goes the argument. While this perspective neglects the materiality of information (Dourish/Mazmanian 2013) it nevertheless helps articulate some of what has been going on in banking and finance as the industry has sought the surer money of fees over the risks of debt.

In *Le Capitalisme de rente: de la société du travail industriel à la société des rentiers*, the France-based economist Ahmed Henni (2012) develops the provocative thesis that, progressively since the 1970s, industrial capitalism of the sort analyzed by Marx is being transformed into a rentier capitalism, a system based on the continuous collection of rents not tied to industrial production. [6] Henni echoes other contemporary critics, such as the Italian autonomist Marxists, who similarly write of a "becoming-rent of profit" (Vercellone 2008): rents, which were marginalized during the heyday of Fordist capitalism in the mid-20th century (Vercellone 2008, II.2), or which were seen as beyond the pale of modern ethics because of their association

[6] All translations from Henni 2006, 2008 and 2012 are the author's own.

with "princely favors" (Henni 2012, 9, quoting Max Weber), are becoming the generalized form of value extraction.

These authors make different arguments. For Henni, it is the rise of the possibility of "infinite electronic duplication" instead of "destructive consumption" facilitated by technology that effects this shift into rentier capitalism (2012, 10). For Vercellone and others (Lazzarato 2014, Marazzi 2011), it is the transformation of communication into a form of labor such that life itself and human social relations are "put to work" (Bria 2009, 392) to generate value. Think the monetization of one's network of "friends" by Facebook. Both Henni and Vercellone spotlight patents, licensing fees, and the leveraging of knowledge via technology. The result, for Henni, is an offloading of production and its attendant antagonisms elsewhere—to China, in his account—and the rise of a system of annuities without risk that support a new "configuration of patricians and plebians", an "anti-modernity", a "regression" to a "patrician capitalism" (Henni 2012, 13). Elsewhere, Henni writes "The conflicts that drive rent capitalism today are no longer generated by class antagonisms. They revolve for the most part around defending positions and statuses giving access to the redistribution of rents." (Henni 2006, 204) Like Marx, Henni emphasizes the concentration of capital but whereas for Marx this concentration was based on surplus value aided by the expropriation of public or common resources as well as speculative financial ventures, for Henni is about "using the state and prestige to establish … social supremacy" by ensuring a continuous flow of rent, a perpetual annuity to the new patricians (Henni 2008, 104).

What is so interesting about the discovery of the blockchain by banking and finance professionals however is that they envision it will bring new life to old ways of making money—exciting ways, too. Fees are boring. Critical theorists' objections aside, finance professionals I spoke with just don't see them as particularly compelling from a business standpoint or from an intellectual standpoint. These people did not get in the business to devise new ways of generating fee income. They got into the business to trade in risk, and to devise new ways of speculating on the future. They want to move away from rents. Fees are "weird" and "dumb" and "being regulated away", anyway, they say. At least some of the people having these kinds of blockchain dreams want to get back to the business of finance. They want to get back to trading in risk. The blockchain is exciting precisely because it can permit a new, re-risking of finance.

And a re-risking that is "safe" for the financial system.

Regulatory changes designed to prevent another systemic crisis mandated new, higher capital requirements. This impacted a key measure of banks' profitability, their return on equity (ROE). ROE is the ratio of profit to a financial institution's (or its shareholders') equity. Equity does not refer simply to the capital a bank holds in reserve, but rather its mix of debt and other assets it holds. Banks argue that higher capital requirements are a drag on this measure of profitability: if a bank earns the same amount of profit with higher capital than it did with lower capital, its ROE declines. In the wake of regulatory change, banks understandably argued against these requirements

(see Admati et al. 2013, Admati 2013). As economist Anat Admati wrote for the New York Times:

> "Despite the financial crisis, bankers lobby furiously against increased equity requirements, lamenting that their return on equity might decline. But return on equity is meaningless without accounting for the risk of the equity, which depends critically on how much debt is used to leverage it."
> (2013)

One factor that affects ROE is that a bank's equity includes any trades that have not yet cleared and settled. Depending on the type of asset, this delay can be anywhere from three to twenty days. Getting that asset off the books helps preserve a bank's ROE.

As former JPMorgan Chase executive and credit default swap pioneer Blythe Masters explained at the conference, "post-trade settlement" is ripe for being sped up. Doing so thereby also reduces the so-called "latency" of an asset—its limbo status while its sale to another entity is being processed. Doing so also requires new processes and infrastructures that would take the place of all the back office operations that currently handle clearance and settlement.

Enter the blockchain: Digital Assets Holding, R3's development of a new post-trade settlement platform called Corda, and other experiments in this space are all attempting to use a distributed ledger—often a "permissioned" or "private" one not open to the world but only to regularly transacting large-scale financial institutions—to reduce settlement times. Barclays demonstrated "smart contract templates" in April, 2016, on R3's platform to simplify the legal documentation process and trade requirements of derivatives trading. The idea is that such trades can take place automatically over a permissioned blockchain after certain preconditions are met.

In theory, distributed ledgers not only allow for speed-up. They allow for "safe" speed-up: with everything in an unalterable, traceable and shared record, everything is trackable. As Masters explained: "Multiple parties can each access the same single ledger, the golden ledger, if you will." That ledger "represents an incorruptible record of truth because of mass [verification] of computers in the network." She continued, "this technology has far broader implications than merely [payments]. Costs, risks and inefficiencies can be drastically reduced." As another commentator put it, "if you have really really fast movement, and instantaneous payments, you should know instantaneously what's going on."

Speed up, the rendering of idle assets active in a shorter period of time, higher trading volume as a result of higher settlement speeds, and reduced IT and labour costs. All from a "golden ledger".

The hidden life of labourless ledgers

With a permissioned blockchain system for post-trade settlement, people can stop counting: any number of intermediaries in the current settlement process

from custodians to central securities depositories might be eliminated. The promise of putting all asset information into a blockchain at the moment of the trade itself generates automaticity of clearance along with persistence of the information shared across all nodes in the network. There is replication of data across the network, alongside the elimination of the redundancy of multiple offices or parties doing essentially the same work of processing a trade (Pinna/Ruttenberg 2016).

On one level, therefore, the vision of using distributed ledgers to solve settlement latency and related problems permits speculation about "firing the IT department", or, at least, diminishing costs by eliminating other human and institutional intermediaries. Notaries, for instance, or those responsible for collateralizing trades (Riles 2011). This, in turn, is tied to the imagination of real-time, automatic or even anticipatory trading (fantasies that have occupied finance professionals before, see Riles 2004, Miyazaki 2006).

My admittedly speculative conclusions revolve around how finance professionals' envisioning of blockchain systems poses problems to the modern settlement, as I indicated in the introduction to this paper. The first argument has to do with the separation of humans from machines. The second argument has to do with what I will call the dispersion of the human/asset network into risk. I shall take up each in turn.

First, real-time trading executed in a blockchain echoes the young programmer's ideas about limitless production, abundance, and ice cream. Again, this is a preoccupation of other heterodox financial practitioners (Maurer 2011). The blockchain's smart contracts or self-executing trades introduce new economic actors of uncertain status. Would they be best thought of as robots? As legal persons? As electronic animals? Or as densely internetworked with other legal and natural persons—the corporations that animate them, the humans that set them in motion and that they potentially replace? Machinic-human integration may be the modern day version of the natures/cultures denied by the modern settlement, and not just in the case of the blockchain.

A smart contract, however, may do some of the work of reallocating subject status among the actors in the networks of finance. Latour might say a smart contract purifies subject/object relations in the blockchain world. A blockchain contract would be "smart" only when it is automatic, de- or un-personed. Smartness thereby inheres in transcendent subjecthood.

We've heard this kind of thing before. Writes Charles W. Mills, of orthodox social contract doctrine and its abstract, atomistic individual, the "details of [the] flesh do not matter" since no matter whose flesh it is, it is judged to be owned by a self that is "equally rational, equally capable of perceiving natural law or [its] own self-interest" (Mills 1997, 53). This is, of course, the vision of the racial contract: one whose unmarked whiteness is denied by the very techniques of equilibration and erasure that facilitate both accounting and contract. This is also the vision of the sexual contract, one whose genderlessness depends on the exclusion of women from contract as subjects (Pateman 1988). Smart contracts do not just potentially reinscribe the un-personed, genderless, raceless robot as distinct from the personed human—denying machinic-human integration—but also elevates this vision of the contract as

dependent on a body politic in which some bodies are simply not "politic" (Mills 1997, 53).

This argument may stray too far into the realm of science fiction. Consider a historical rather than theoretical analog, however: management accounting's role in facilitating the slave trade and the Atlantic plantation complex (Cooke 2003). The slave trade depended on a racial contract that made slave owners persons by rendering enslaved Africans ledger entries. Ian Baucom details how double-entry bookkeeping facilitated insurance for the transatlantic slave trade. Once enslaved Africans were entered on a ledger, they could be mathematically manipulated to generate new forms of value. Such manipulation allowed the equilibrating of values through their quite literal deracination. When Captain Luke Collingwood threw 132 of his cargo overboard and to their deaths in the sea, Baucom writes, he "had not so much murdered a company of his fellows as hurried them into money" (Baucom 2005, 93). He reduced their latency, one might say, rushing them into an insurance claim and thus another form of capital.

My second concluding argument has to do with how finance professionals before the crisis were already destabilizing the modern settlement. With finance ascendant, people and assets were disaggregated into risk bundles, which could be reaggregated into new assets and sold on the markets. Rather than viewing a marketplace of people and property, finance professionals looked out onto a landscape where any entity could be disaggregated, remixed with other pieces and turned into new assets. Mortgage securitization became the prime example during and after the crisis. After the mortgage meltdown, however, such practices became subordinate, and rents were increasingly on the rise, as Henni, Vercellone and Marazzi argue. Indeed, the proliferation of payment technology and new strategies for creating streams of fee income might suggest if anything a reintegration of the person, but rendered plebian or more precisely serf, tribute-bearer, in a world where markets were flat and finance sought new revenue streams.

By facilitating speed-up, reducing latency, and maintaining a persistent and verifiable record, distributed ledgers have the potential to reactive pre-2008 practices of making and managing risk-stratified products. This, I think, is why they are so exciting to finance professionals who lived through the crisis. Just as credit default swaps and collateralized debt obligations offered up subprime borrowers to finance, distributed ledgers potentially reopen these pre-2008 practices of managing risk-stratified products and renegotiating the norms of the financial markets. Replacing rents with risk once again, risk made faster, made even more fine grained because even near-infinite divisibility of persons and assets into new instruments can be tracked in the blockchain. A magnification of all the qualities that make risk profitable while simultaneously making it "safe" because of that "golden ledger", the blockchain?

This renegotiation would also be one of the norms of personhood, too. Several propositions for blockchain systems involve the management of online reputational assets. One's likes on Facebook or upvotes or downvotes on a

"sharing economy" service like Uber can be mixed with pieces of one's credit history and re-scored to make new assets for finance (Goldman Sachs 2016).

I brought up Stephen J. Gould's (1984) essay on the contingency of human equality with my programmer friend. This is the essay where Gould argues we humans are lucky that there is no other extant hominin species concurrently occupying planet Earth. Things would have turned out quite differently for our moral philosophy if there were. What if, I said, we create new consciousnesses in our experiments with smart contracts? Even if we didn't, what if the law decided it needed to treat smart contracts as having promisees, promisors, and beneficiaries and thereby concocting for them legal personhood? Would we have to contend with whether those persons had the same rights as natural persons? But the corporation is a person, he said. And then trailed off. I was left to ponder whether the distinction between natural and legal person would be something that could be tracked in a blockchain. How would we account for that? **[7]**

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