

**From:** "jeffrey E." <jeevacation@gmail.com>  
**To:** Joi Ito <[REDACTED]>  
**Subject:** Re: rough draft of a paper on accounting  
**Date:** Sat, 23 Apr 2016 17:24:24 +0000

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english when mixed with mathematics, is always a problem, ie. if nothing is bigger than infinity, , am something is bigger than nothing, does that mean something is bigger than infinity, value the same concept. convertible in to a local currency. sometimes is value, . but ONLY in money terms. . and only locally, . the locality of money is crucial.

On Sat, Apr 23, 2016 at 1:11 PM, Joi Ito <[REDACTED]> wrote:  
How about this for value:

The idea of "value" is a reductionist view of the world that is useful to scale the trade of commodities that are roughly of equal worth to a large set of people, but in fact most things have very different values to different people at different times and I would argue that much if not most things of value can't and probably shouldn't be reduced to numbers on a spreadsheet.

An email from you to me about a feeling that you had about our last conversation is probably valuable to me at a particular time and probably not useful for most people. An apple to a hungry person is worth a lot more than an apple to a apple orchard owner. If you lived in Boston and all you ate were Big Macs, having your paycheck paid in Big Mac certificates would probably more valuable to you than cash since the price of Big Macs might fluctuate. Context is everything.

Then there is the issue of exchange rates. My wife moved to Boston several years ago, but still looks at prices and converts them into Yen. She sometimes comments on how expensive something has gotten because the value of the Yen has diminished. Because most of our earnings and most of our spending are in dollars I always have to remind her, the "value" in Yen is irrelevant to her now, although to her mother who she talks to in Japan cares about the "value" in Yen.

### **Can't Buy Me Love - The Beatles**

The economics notion of consumers making financial decisions to maximize "utility" as a kind of proxy for happiness is another example of how the notion of a universal system of "value" oversimplifies the complexity so much that the models derived assuming that humans are a "economic rational unit" in a marketplace don't work.

On Apr 23, 2016, at 12:35 PM, jeffrey E. <jeevacation@gmail.com> wrote:

some good points. . " in search of certainty," could be its subtitle. . I suggest more drilling on " value " . on types of hacks to current system. etc

On Sat, Apr 23, 2016 at 12:12 PM, Joi Ito <[REDACTED]> wrote:  
Super rough draft on something I'm thinking about writing about accounting and book keeping.

Tell me if you think it's worth writing and if you have any idea or suggestions...

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Reinventing Bookkeeping and Accounting

Double-entry bookkeeping was deployed in its modern form in the 1300s and while minor innovations have occurred since then, the fundamental atomic unit of tracking and managing value - our accounting system - is still based on this 700 year old invention. With modern computers, networks and cryptography, we have the opportunity to fundamentally change one of the most important and empowering, but also limiting elements of modern civilization.

Accounting underlies finance, business, the management of the State's resources and is the way that the world keeps track of almost everything of value. While companies will keep track of how many widgets, contractual obligations, employees they have and many other things, the accounting system and the laws that support it, require us to convert just about everything into monetary value and enter it into some ledger system using the 700 year old double-entry bookkeeping method.

When you take, for instance, a contract that pays out a million dollars if it rains tomorrow, and put it into your accounts, you will be required to guess the chance of rain - maybe 50% - and value that asset at something like \$500,000. The contract will actually never pay out \$500 - it will either be worth zero or a million dollars in the end, but if you were forced to trade it today, you'd probably sell it for something close to \$500,000 so for tax and management purposes, you "value" the contract at \$500,000.

A company's accounts are full of cells with numbers in them that represent a sort of numerical value denominated in some currency - Yen, Dollars, Euros - and those numbers are added up and organized into a balance sheet and a profit and loss statement that shows the health of the company to investors and profits to calculate the amount of tax owed to the government.

At the very top level, your balance sheet has a list of assets and liabilities. If you looked in the assets column you'd have a bunch of things that you would be reporting as having value including things like printing presses, lines of code, intellectual property, obligations from people who may or may not pay you in the future, cash in various countries' currencies and bets on things like the prices of a commodity in the future or the value of another company in the future.

As an auditor, investor or a trading partner, you might want to drill down and try to test the assumptions that the company is making or test what might happen if some of the assumptions that the company were making changed. You might also want to understand how buying the company would change your own company based on the way your obligations and bets interacted with theirs. Today you would rack up millions of dollars in auditor fees to "get to the bottom" of most big companies. The process would involve manually reviewing the contracts and the assumptions made in every cell of every spreadsheet. That's because accounting is a very "lossy" process reducing complex functions with probabilities and dependencies into static numbers at every step. The underlying information is stored somewhere, but most of it requires manually digging around.

The modern financial system is full of companies who have figured out ways to guess when investors and the companies themselves have made mistakes in their assumptions. These companies bet against the companies and financial assets with inaccurate pricing or are somehow able to take advantage of the gap in information and convert this into financial returns. Also, when these mistakes are duplicated across the system it cause fluctuation amplification which also allows companies to make more money both as markets rise as well as fall if they can guess in advance of those fluctuations. In fact, as long as the whole system doesn't collapse, smart traders make more money on fluctuation than on stability.

Just like rodent exterminators aren't excited about the idea of rodents being completely eliminated - they would not longer have jobs - those financial institutions that make money by "making the system more efficient and eliminating waste" don't really want a system that isn't wasteful and is very stable.

Right now, the financial system is built on top of a way of thinking about money and value that was designed back when all we had was pen and paper and where reducing the complexity of all of the web of

dependencies and obligations was the only way to make the system functionally efficient. The way to reduce to complexity was to add it up and simplify it. The current technology just builds on these 700 year old building blocks trying to make the system “better” by doing very sophisticated analysis of the patterns and information without addressing the underlying problem of a lossy and over-simplified view of the world. This view of the world being that everything of “value” should be as quickly as possible reduced to some “value” where “value” is a number denominated in “money.”

Today, we have the technology and the computational power to create a system of accounts that isn't as lossy and in fact could retain and deal with a lot of the complexity that the current system of accounts was meant to avoid.

There is no reason that every entry in our books needs to be a number. The cells could be an algorithmic representations of the obligations and dependencies that it represents. In fact, using machine learning, accounts could become sophisticated probabilistic models on what might happen depending on how things around it changed with the “value” of any system being different depending on who was asking, where that person was, and in what time frame.

Today, when the Financial Stability Board conducts a stress test, it gives a bank a scenario - changes in the credit markets or the prices of certain things. The bank is then required to return a report on whether it would crash or remain solvent. This requires lots of human labor and work to go through the accounts and run simulations. What if the accounts were all algorithmic and you could instantly provide the answer to the question. What if you had a learning model that could answer a more important question - “What sets of changes to the market WOULD make you crash and why?” That's really what we want to know. We want to know this not just for one bank, but the whole system of banks, investors, and everything that is interacting financially.

When I'm buying something from a company - lets say a credit default swap from your company, AIG. What I want to know is whether, when the day came to pay the obligation on the impossibly unlikely chance that the AA mortgage backed bonds that I was betting against defaulted, you'd be able to pay. Right now, there is no easy way to do this. However, what if all of the obligations and contracts, instead of being written on paper and recorded as numbers, were actually computable and “visible.” You'd immediately be able to see that, in fact, in the scenario in which you'd have to pay me, you'd actually have no money since you'd written similar contracts to so many people that you'd be broke. Right now, even the banks themselves can't see this unless an internal investigator figures out to look for it and finds it.

With systems like Enigma, there are ways that we might be able to event keep these accounts open to each other without compromising business and personal secrecy and privacy. While computing every contract as a cell in a huge set of accounts every time anyone asked a question would exceed even today's computing capacity, but with machine learning and the creation of models, we might be able to dampen if not stabilize the massive amplifications of fluctuations that occur today because we are building our whole system on a house of over-simplified cards with the handlers having an incentive to make them fragile and opaque - to introduce inefficiencies that they can exploit later to make money.

I think that the current excitement about Bitcoin and the Blockchain have created a great opportunity to rethink the fundamental system of accounts. I'm much more interested in this than apps for banks or even new ideas in finance, which will address some of the symptoms without taking a shot at eliminating one of the root causes of the impossibly complex and outdated system that we've build on a clever trick invented by traders of the 1300s.

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