Gradually and Then Suddenly:

The Future of Economics in Light of the History of Financial Information Technology

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Abstract

The history of economics is, to a considerable extent, the history of financial information technology. What counts as financial information, who gets to decide, and how is that information shared and reshared? Because wealth and property are social constructs, the answers to such questions have change dramatically over time—particularly, with every new advance in financial information technology. Still, the most fundamental economic activities have remained largely the same. The act of buying bread is as old as the world; what's changed through the years is how, not whether, bread is bought. But that "how," small though it may seem, is what financial revolutions are made of. The future of economics is therefore best understood in light of the history of financial information technology.

1 The History of Financial Information Technology

The financial system we know and love or, as the case may be, love to hate today grew from the soil of Northern Europe in the 16th and 17th century.

It was the Amsterdam Exchange Bank that first made it possible for merchants to transact with each other by writing checks, despite the dozens of currencies circulating freely in what was the financial equivalent of the Wild West. Checks directed the bank, a trusted third-party with all and sundry currencies on reserve, to credit the seller's account and debit the buyer's. Few, if any, heard it—their hearing wasn't good enough, or the sound of history in the making wasn't loud enough—but, when the Dutch *Wisselbank* was founded in 1609, it was a step forward in financial information technology.

Sometime later, in 1694, the Bank of England was founded. The bank began issuing banknotes. Banknotes were like checks in that they were, basically, promissory notes. Unlike checks, however, transacting parties did not actually need to have open bank accounts to make a withdrawal: anyone could cash them in. That, not to mention the introduction of public debt and joint-stock companies, was another step forward.

Meanwhile, the Stockholm Banco had begun the practice of fractional reserve banking. Realizing that a fraction of the bank's deposits could safely be lent out, and thus generate interest, the Banco transformed credit into an asset on its balance sheet and deposits into debts. The Banco realized, in other words, that it could safely turn a profit and stimulate the economy more broadly by lending out more specie than it had on reserve. And so, in 1657, yet another step forward was taken.

Finance was thus revolutionized gradually, step-by-step, with one advance in financial information technology after another. An increasingly abstract, global financial system eventually emerged in which updatable, legally-binding, interlocking balance sheets—or ledgers—began to steal the limelight from the enormously heavy, shiny, metal objects "backing" them. But not everyone saw the wave of the future coming. And while it carried forward those who did, it swept away those who didn't. Spain, with its ravenous appetite for precious metals, was too busy plundering the Americas to notice the financial revolution already underway. But, in the end, all the gold and silver in the New World couldn't save that backwards-looking kingdom from defaulting on the debts it owed to the very same moneylenders and bankers it had expelled, years prior, in an act of pious cruelty.[1] "'How did they go bankrupt?'" "Two ways," as Hemingway's joke would have it. "Gradually and then suddenly."

The same can be said of history. History, particularly financial history, is made gradually and then suddenly. In retrospect, the financial revolution would seem to have happened overnight ... as if, all of a sudden, in the wake of the Glorious Revolution (1688), there was a quantum leap, which turned the world upside down. But the suddenness with which the financial revolution was brought on is more apparent than real. The reality is that, in the time leading up to it, financial information technology advanced gradually—so gradually that one day it suddenly dawned on those who failed to notice the slow but steady pace of progress over the years that the world had been made new while they weren't looking.

In fact, while our financial system grew from the soil of Northern Europe in the 16th and 17th century, the seeds were planted long before that: as early as the 13th century, in Italy, in Venice, Genoa, and Florence. Without the advances in financial information technology made then and there, the financial revolution would never have happened.

The first great advance was made in 1202 by Leonardo Pisano, better known as Fibonacci, whose textbook *Liber Abaci* not only introduced Europe to Hindu-Arabic numerals (1, 2, 3, 4...), but also spelled out the practical bearing of the Far East's numbering system on trade and finance. The classical Roman numerals (I, II, III, IV...) with which Europe did its counting and accounting back then made it virtually impossible to perform even the most rudimentary mathematical operations.[2] Addition, subtraction, division, and multiplication—to say nothing of just writing large numbers (e.g., 3887 = MMMDCCCLXXXVII)—were simply out of the question without an abacus and, what is more, a highly educated abacist. Hindu-Arabic numerals brought mathematics "within the reach of any warehouse clerk; they democratized mathematics."[3] The implications for trade and finance were profound. Pisano taught Europe, among other things, to perform present value analysis, calculate and compound interest, fractionalize sums large and small, quantify value across a variety of weights and measures, and apply ratios to trade assets, precious metals, and specie.[4] Suddenly, bookkeeping was feasible. It was a watershed moment. But no one familiar with the history of Bitcoin's icy reception will be surprised to learn that Pisano's new financial information technology—for all good it could, and indeed would, do the world—was met with staunch opposition from the powers that be. The religious, political, and financial authorities clung desperately to their unwieldy numerals and abacuses for centuries to come, reviling the commoners who, for their part, eventually rode the wave of the "infidel's" new information technology right into the halls of power.[5] By the time the establishment realized what was happening, they were poor and there were clerks sitting on their thrones. The high art of the Italian Renaissance was the direct result of this transition of power. Donatello's David was bought and paid for by new (Medici) money.

The second great advance in financial information technology, which went hand-in-hand with the first,[6] was the emergence of double entry bookkeeping around 1300. The eminent German economist Werner Sombart wrote that "one cannot imagine what capitalism would be without double-entry bookkeeping: the two phenomena are connected as intimately as form and content,"[7] and his view was neither implausible in itself nor uncommon in the history and philosophy of economics: it makes sense (capital "is," after all, nothing but what can be represented on a well-maintained balance sheet), and it was widely shared by Adam Smith, Max Weber, and Karl Marx, among others.[8] At the very least, double entry greatly reduced the risk of theft, fraud, and human error in trade and finance, all the while enabling abstractions like credit and debt to make their way onto private and public ledgers, reifying them.[9] Double entry—"among the finest inventions of mankind," according to Goethe—probably developed organically in Italy, if not directly from Pisano's work, then indirectly from the flurry of economic activity it helped unleash. But wherever it came from, it was finally codified and popularized in 1494 by Luca Pacioli's *De computis*. Once again, the door to the future was cracked open. And once again, the establishment tried to keep the future at bay. (Moneylending was thought to be a mortal sin,[10] and "the desire to acquire," to which the practice of bookkeeping gives pointed expression, was not yet thought to be "a natural and

ordinary thing.")[11] Nevertheless, Europe was eventually brought—or rather dragged, kicking and screaming—to the point of measuring and moving its wealth by putting pen to carefully curated, paper ledgers.

2 The Future of Economics

When Satoshi Nakamoto published "Bitcoin: A Peer-to-Peer Electronic Cash System" in 2008,[12] he, too, was making an advance in financial information technology. But, as we can now see, advances in the field of financial information technology are advances in financial systems themselves. The ledgers with which Pisano and Pacioli laid the foundations for economics as we know it today had long since moved from paper to bits and bytes. Satoshi Nakamoto moved them again: from bits and bytes controlled by unaccountable, inscrutable third parties, to bits and bytes visible to all and controlled by none. In 2013, Vitalik Buterin went a step further, envisioning ways in which Bitcoin's underlying technology might be applied to a wide variety of use-cases, including especially the representation of financial instruments.[13]

The powers that be were having none of it, of course. But while the few establishment-types who deigned to take notice of bitcoin were telling us that it was just another tulip-mania at best, a fraud at worst, Bitcoin's market cap was soaring from $1.25 million in 2011 to $1.25 trillion in 2021. Now firmly entrenched in the popular imagination and steadily gaining traction with the very same people who spent the last decade maligning it, Bitcoin is here to stay. As for the future envisioned by Vitalik Buterin, however, in which the underlying technology of decentralized finance (DeFi) finds its way into centralized finance (CeFi), it is not even here—at least, not yet. DeFi and CeFi are like parallel universes, ships passing in the night: they rarely, if ever, come into contact with one another. But the explosive growth of DeFi was only the opening act, not the main event. The goal was never just to send DeFi on a decades-long bull run; it was always, rather, to blur the lines between DeFi and CeFi and thereby democratize the financial system while, at the same time, tapping into the vast, untouched reserves of liquidity buried deep beneath the antiquated financial information technology on which the financial system now runs.

Here, at the tip of the spear of the effort to put blockchain technology to use, we're doing just that. The first step in this direction was taken in September 2021, when Tradeteq, a member of the World Economic Forum and the founding member of the Trade Finance Distribution Initiative (TFDi)—a consortium of dozens of the world's leading banks and non-bank financial institutions established by the International Trade and Forfaiting Association (ITFA) for the purpose of liquifying trade finance—completed the world's first trade finance-based non-fungible token (NFT) transaction on the XDC Network, the first and only blockchain network invited to join the TFDi. In a historic first, now prominently featured in the World Trade Organization's recent report, "The Promise of Trade Tech,"[14] Tradeteq repackaged trade finance assets and tokenized them on the XDC Network, as an NFT, in such a way as to entitle investors to the underlying off-chain assets.[15]

It's no accident that we're focused primarily, if not exclusively, on global trade and finance. The first dominos to fall in the decentralization of centralized finance will fall here: where the flow of goods and services around the world meets the need for financing. Even Gary Gensler, the current

U.S. Securities and Exchange Commission chair who, as a crypto skeptic, needs no introduction, had no difficulty seeing that trade finance is, more than any other space, "ripe for blockchain technology."[16] Trade finance is the opening wedge. The simplest reason for this is that the $1.7 trillion (and growing) trade finance gap—the gap between the amount of financing needed by enterprises, on the one hand, and the amount they manage to receive, on the other—stems from the inaccessibility of trade finance assets to capital markets. But the inaccessibility of trade finance assets to institutional and retail investors who would otherwise leap at the multi-trillion-dollar opportunity represented by such a low risk, high reward asset class stems, in turn, from the lack of trust prevailing between parties performing paper-based transactions of extraordinary complexity across borders. With their cardinal virtues of transparency, immutability, and security, blockchains are uniquely suited to the task of liquifying trade finance; and none so much as the XDC Network, an enterprise-grade, EVM-compatible, hybrid blockchain, with public and private states, which was built from the ground up for the purpose.

The NFT transactions were, however, only just the beginning. The second step was taken in early 2022, when Tradeteq began the process of repackaging trade finance assets, pooling them, and then issuing fully regulatory-compliant, fungible security tokens, representing fractional shares of the revolving asset pool, on the XDC Network. The result of this advance in financial information technology will be not only to make a highly attractive, previously inaccessible asset class widely accessible to institutional and retail investors alike (if only they have an internet connection), but also to get small, medium, and large enterprises the financing they need to survive and thrive, driving wealth and job creation the world over.

There's more to come off the back of this: not least, a yield-generating stablecoin supported by the (tokenized) real-world goods and services which make up the backbone of trade finance, all transparently sourced on-chain for the world to see move about in real-time. With the underlying real-world goods and services thus tokenized and deployed on-chain, the ultimate sources of the stablecoin's value will be crystal clear at all times. Even the most frequent, most thorough audits will come to seem unreliable by comparison. Moreover, as the real economy takes on the transparency of the blockchain, the blockchain will simultaneously cease to be a disembodied ledger, floating freely through the vacuum of cyberspace; it will, instead, shoot roots deep into the ground of the real economy. To the age-old question of money's backing—to the question, that is, of what it is that underlies the value of money—a powerful, new answer will be given. The value of money is an epiphenomenon, determined by money's purchasing power over the goods and services that make living or, in the words of Hobbes, "commodious living" possible. In other words, money can function as a unit of account and as a store of value only insofar as it can function, first of all, as a medium of exchange. As a medium of exchange, however, the value of money is (as runaway inflation makes only too apparent) relative to the goods and services that we want or need to exchange it for. Money backed by real-world goods and services will be backed, then, by the very things for which it was designed to be a medium of exchange. A container ship sailing across the Atlantic, loaded with products and materials sourced from the far reaches of the earth is the real economy in microcosm. That, the real economy, tokenized and transparently sourced—and not a dubiously audited reserve of fiat or commercial paper—will itself ensure currency's value in the real economy.

Blockchain technology, surrounded as it is by so much hype, has a soft periphery, which is the first thing that those on the outside looking in are bound to notice about it. But that soft periphery, which stirs strong emotions both for and against cryptocurrency, can only conceal its hard core—its use-cases—for so long. Over time, as efforts like ours blur the lines between DeFi and Cefi, the hype will give way to utility. Gradually and then suddenly.

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