Kevin Roose writes: Recently, after a long, drawn-out fight over an overdraft fee, I decided to break up with my bank. I withdrew my balance, closed my accounts, and began looking around. I wanted to find a -disruptive bank, in the Silicon Valley parlance—one better than the opaque, fee-filled behemoths I'd dealt with in the past.

The problem, I quickly learned, is such a thing doesn't yet exist. The big banks all offer basically the same bevy of services, and small banks and credit unions tend to skimp on the add-ons I need, like mobile-banking apps and spending trackers. All of them, big and small, run on the same outdated infrastructure—paper checks, debit cards that require punched-in pins, wire transfers that take days to clear. Despite Wall Street's reputation for ruthless efficiency and staying ahead of the curve, the last truly important innovation in consumer banking might have been the ATM.

To listen to Silicon Valley tell it, that will change soon. "I am dying to fund a disruptive bank," venture capitalist Marc Andreessen tweeted earlier this year. Financial start-ups—known collectively as "fintech"—are spreading like kudzu, each with a different idea about how to usurp the giants of Wall Street by offering better services, lower fees, or both. Bitcoin and other digital currencies are the tech scene's infatuation du jour. But a number of other companies are finding success by innovating within the monetary system we already have. "When I go to Silicon Valley … they all want to eat our lunch," lamented -JPMorgan Chase CEO Jamie Dimon this year.

Part of the reason the tech world is interested in finance is the sheer amount of money involved—financial services is a $1.2 trillion industry, and U.S.-based fintech start-ups raised an estimated $1.3 billion last quarter alone. But banking is also a prime candidate for disruption because, like much of the old-line corporate world, it tends to run on bloated, creaky technology. Even something as simple as applying for a loan can take weeks or months, thanks to the sheer number of human hands such transactions pass through. And, since each intermediary wants a cut, fees are everywhere. Undercutting big banks and speeding up processes might not be as sexy as, say, creating the next Snapchat, but it's low-hanging fruit for techies who want a way in to a lucrative market. After all, today's megabanks are really just bundles of particular, loosely related services cobbled together by years of acquisitions and market -consolidation. If those bundles can be broken apart, the start-up world's revolution looks a lot more plausible.

Several weeks ago, at a fintech conference in San Jose, I saw dozens of these start-ups in action. Some were taking on more frivolous areas of finance (one start-up built an app to check the balance on your gift cards), while others were attacking the core functions of a bank—taking and storing deposits, making loans, sending money from place to place. A typical example is Roostify, a San Francisco start-up that says it is "accelerating and simplifying mortgages" with software that allows a potential home buyer to upload tax and financial documents to a secure data room, where it can then be viewed by loan officers and lenders simultaneously, making for a faster closing process with greater transparency. Roostify might not sound like an earth-shattering innovation, but in financial services, where efficiency is everything, marginal improvements can be worth billions.

“Financial innovation was a four-letter word during the 2008 crisis,” said Nigel Glenday, a New York–based investment banker who had come to San Jose to suss out the competitive landscape. “All banks do is move bits around,” says Rajesh Jayaraman, an entrepreneur who has worked at several fintech companies. “There’s no physical product. And as banks progress, they’re going to look more and more like software companies.”

But starting a bank isn’t like creating a food-delivery app. It’s an arduous hoop-jumping ordeal, made more -difficult by a maze of regulatory requirements and drawn-out compliance processes. It also requires a tremendous amount of money—billions of dollars, if you want to be able to compete with the Bank of Americas and Wells -Fargos of the world. (And forget about replacing capital-markets banking—if Coca-Cola needs a billion-dollar bridge loan, no start-up will be nearly well capitalized enough to give it to them.) And even with relatively simple kinds of financial disruption, there are plenty of obstacles.

A company named Simple found this out the hard way. Started in 2009 by two M.B.A.’s and a Twitter engineer, BankSimple, as it was then known, gave users debit cards and a mobile app that featured cutting-edge saving and tracking functions. Fees and fine print were minimal; customer service was excellent. “By not sucking, we will win,” one founder crowed. But getting a banking charter proved harder than expected, and Simple decided to partner with the -Bancorp Bank to handle its deposits and withdrawals. Last year, Simple sold itself to a banking group called BBVA for $117 million—not terrible, but hardly the world-shaking transformation its founders envisioned.

Other companies may fare better, depending on which piece of the banking pie they go after. One promising area is wealth management, since so much of the process of recommending stocks and bonds to clients is already done by computers. In the last few years, companies like Betterment, Wealthfront, Personal Capital, and FutureAdvisor have raised more than $100 million to help a tech-savvy clientele invest their money wisely, using technology that allows them to charge much lower fees than a traditional financial adviser.

“The existing industry has failed to provide good advice to as many people as needed,” says Adam Nash, the CEO and president of Wealthfront. Nash, whose company has raised just over $65 million in venture capital, doesn’t like the term disruption, since it implies that old and new models can’t coexist. (“Did Amazon disrupt Walmart? Not exactly. Walmart’s still doing pretty well.”) He sees Wealthfront as a kind of Charles Schwab for millennials. Sign up for an account, and you’re asked a few questions to determine your risk tolerance. After you make your choice, Wealthfront’s software picks a mixture of stocks, bonds, low-cost mutual funds, and other assets and invests your money for you automatically. In the past 15 months, Wealthfront has grown 800 percent. “We’re 100 percent focused on Gen Y,” Nash says. “They don’t care about having a phone number—they like an automated solution, they want it inexpensive, and they love passive index investing.”

Of course, these companies are still tiny by Wall Street standards. And as they grow, the temptation will be to sell to the large institutions they're trying to upend. ("All these guys are kind of waiting for Visa to pick them up," said Glenday.) But even if they remain independent, it may be hard to do more than nip at Wall Street's ankles. Big banks have huge, systemic advantages over start-ups, from armies of lobbyists in Washington to access to near-bottomless supplies of cheap capital. And while some of these start-ups are independent big-money players rather than peripheral banklike service-providers, none of them has attempted to assemble the big balance sheets necessary to take on the giants. Of course, tech outsiders have shaken up Wall Street before—most notably, the high-frequency-trading shops that replaced old-school stock dealers—but much of the innovation in banking's past has come from within the sector. "There's a reason why size breeds strength," says Nash. "The closer you are to the money supply, the easier it is."

Still, given enough time and money, there's no reason financial start-ups can't make a meaningful dent in the banking business. After all, people generally like taxis and hotels, and yet Uber and Airbnb have managed to carve holes in those industries. The hostility people like me feel toward their banks should, at least, spur some well-funded competition. And who knows? Like many laurel-resting institutions before it, the Wall Street megabank may eventually need to play defense. As Jayaraman says of the big banks, "They do have commanding market share. But so did Pan Am."