CHAPTER 12

THE FUNDAMENTAL VOLATILITY OF THE DIGITAL ECONOMY AS A CONTRIBUTOR TO FINANCIAL INSTABILITY

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Dot-Com Bust and Financial Meltdown

In 2008, financial markets plummeted and took much of the global economy down with them. This was not, however, the only significant drop in the early twenty-first century. The decade began with the boom and bust of the dot-com bubble, or, more generally, of the InfoTech sector. Viewing the 2008 financial crisis through a wider lens that includes the preceding InfoTech boom-bust, one can draw conclusions about the nature of economic volatility in the information economy and about the tools of government to deal with such volatility.

There are several similarities in the two crises. These include deregulatory laws—the Gramm-Leach-Bliley Act of 1999 in the financial sector and the Telecommunications Act of 1996 in the information sector—which helped unleash tremendous activity, much of it financed by debt. Although debt levels were lower in the information and communication technology (ICT) industry than in the real estate industry, their growth had been extraordinary. Telecom alone saw an investment boom of US$1.3 trillion, much of it debt-funded. Between 1999 and 2001, U.S. telecom companies borrowed more than US$320 billion. In Europe, the seven major telecom companies, formerly government organizations with almost no financial liabilities, collectively took on debt greater than the entire gross domestic product (GDP) of Belgium.

However, after a few years of exuberance, things turned sour. Figure 12.1 shows the default rate in the telecom industry relative to the default rate of other industries. Clearly, the failure rate in telecom was much higher, and faster

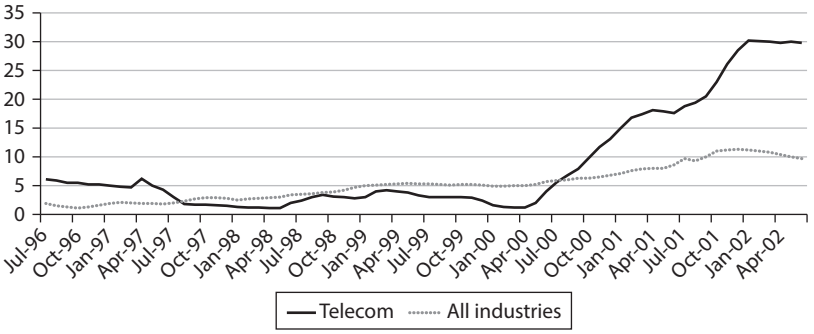

Figure 12.1 Twelve-month rolling average default rates in the telecommunications sector versus all industries

growing. This resulted in an enormous drop in sectoral employment beyond that due to technological progress. Similarly, telecom hardware manufacturing, research, and development experienced major downsizing.

Factors for Volatility

Why did this happen and what lessons can one learn? There are a number of possible explanations for the dot-com bust. There was no demand shortage, so a classic Keynesian-type downturn did not occur. Nor does a monetarist and interest rate–oriented explanation hold. To a limited extent, a credit cycle theory explanation holds (debt secured by collateral led to credit constraints, and shocks were then amplified and spilled over to other sectors). Nevertheless, this only partially describes what had happened.

There are two major possible explanations for severe recessions. The first category can be described as the *perfect storm* scenario. Cycles are caused by random shocks and a rare confluence of events. In both crises, a combination of a slowing economy, bumbling regulators, fraudulent and overwhelmed managers, greedy financial institutions, starry-eyed academics, hyperventilating consultants, gullible journalists, and irrationally exuberant investors came together and combusted. Such a confluence of factors was not likely to repeat itself for a long time. For many, the conclusion is that the shocks are rare as well as random, and therefore there is no governmental solution.

An alternative scenario is that there is a *fundamental instability* in a sector, industry, or an economy. It goes beyond individual fraud, bumbling regulators, or fraudulent management. The fundamental factors are not random but systematic and inherent to the sector. It is a variation of the "Austrian" perspective,

which focused on overcapacity, with a pattern of boom, price wars, bust, shakeout, and new investments. These fundamental factors are apparent in both the InfoTech and financial sectors. And, since both are key parts of the information economy, this instability affects the emerging economic system.

The characteristics of information products include high fixed costs and extremely low marginal costs. Whether it is content, software, networks, semiconductors, data, games, platforms, or devices—they are all expensive to create (produce) and cheap to reproduce, which means high economies of scale. A second characteristic is network effects. The more people consume or use a product or a service, the more benefits they gain from having it. This means that there are incentives both on the scaling, which is on the supply side, and on the network effects, which is on the demand side. There are benefits to being large, having a large market share, being there early, and to expand or possibly overexpand. This leads to the third related characteristic, which is an excess supply. Production increases exponentially while consumption increases linearly and slowly. Intense competition for "mindshare" and "attention" follows with consequences on product style and on marketing. A similar excess supply exists in networks. From 1996 to 2001, capital expenditures in the United States increased at an annual rate of 29 percent, and the incremental cost of bandwidth fell by approximately 54 percent annually. Some carriers had over 90 percent of their fiber "dark." Stock market analysts judged firms by fiber capacity or cell sites, which led telecom firms to overinvest in such physical elements.

Figure 12.2 illustrates the overcapacity in Transatlantic fiber. The line rising to the right shows the capacity of Transatlantic fiber to move information. In just a few years, 1998 to 2002, capacity increased enormously as new fiber cables came online. The descending line represents prices, which fell rapidly. The third line, hugging the bottom of the graph, shows actual capacity utilized. Everything between the utilization line and the capacity line is excess capacity, which is fiber that went dark.

It has been observed by electronic futurist Stewart Brand that "information wants to be free," uncensored and gratis, which means without a direct price. For many decades, information has become cheaper to the point that it is becoming difficult to charge anything for it. Music, video, online publishers, and newspapers are all struggling to charge relatively small prices.

The entire competitive part of the information sector—from music to telecoms to consumer electronics and anything in between—has become subject to a gigantic price deflation in slow motion. The price for everything has fallen enormously. This chronic price deflation shows no sign of abating. It is a great deal for consumers but spells disaster for providers, as prices drop toward marginal cost, which is close to zero, and typically do not cover the full cost. The more efficient the information market becomes due to technology, the faster this process advances. Arbitrage reduces or removes the ability to maintain higher or differentiated prices.

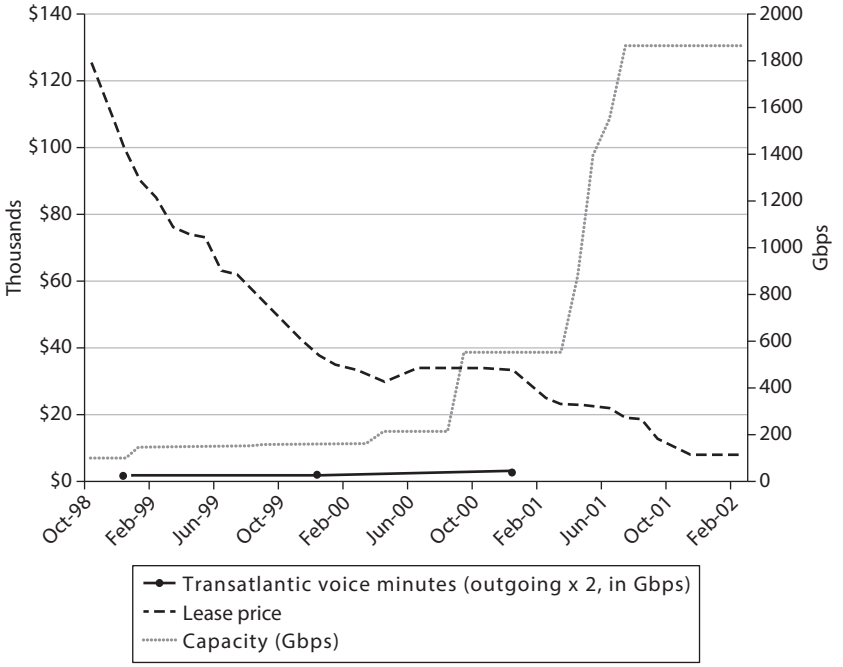

Figure 12.2 Overcapacity in transatlantic fiber

Other factors were also at play, including lags in regulation, technology shocks, and credit cycles based on equity prices. The more a firm built out, the more credit it would receive, and the more the stock market would value the expansion and finance further expansion. But the network effects that seemed such a positive thing on the way up also have a tendency to exacerbate things on the way down. Together these factors lead to expansion and contraction cycles, more general instability, a winner-takes-all type of industry organization, inequality in the benefits from the industry, and a tendency toward oligopoly. Observing the worldwide experience, we can conclude that market equilibrium for InfoTech is not infrastructure competition but oligopoly. One can see this in the emergence of dominance by Google, Facebook, et cetera.

The Impact of the Financial Crisis on the InfoTech Sector

Having examined in brief the instability of 2000 to 2001, let us now turn to the impact of the 2008 financial crisis on the InfoTech sector. As the cost of capital rose and consumer spending dropped, the most immediate impact of the credit crunch and financial crisis was a lack of readily available credit and

higher commercial interest rates. The cuts in central bank interest rates in some countries were not reflected in rates for commercial lending, as banks sought to revive their balance sheets. Meanwhile, banks' risk profiles veered to ultra-caution, with banks imposing stringent lending requirements on borrowers. The difficulties in the credit market saw refinancing costs rise sharply, with telecom debt issuances interest rates higher by 3 to 4 percent compared to the precrisis situation. As the entire market dropped, stocks in the telecom, IT, and consumer electronics (CE) industries collapsed, even though there was nothing fundamentally wrong in the industries themselves. This effect was also reflected by the decline in IPOs. There were twenty-eight IPOs in 2007, but once the crisis hit, IPOs almost vanished, with only two in 2008 and four in 2009. Venture Capital deals dropped by 40 percent. Leading tech companies Microsoft and IBM reduced their workforce by approximately 16,000 people, and Motorola by 4,000 people. Intel's revenues decreased by 20 percent in one quarter. Thus the ICT industry was heavily affected.

Governmental Tools and Their Effectiveness

How did the U.S. government respond to these crises? This gives us an indication of governmental responses to new generation economic volatility. There are several strategies for recovery in an economic downturn: stimulation of demand, stimulation of competition, or stimulation of subsidies. The conceptual problem for InfoTech, both in the dot-com bust and the financial crisis, was that there were no real problems with demand. The second potential approach, the encouragement of competition, was potentially reducing investments by large ICT firms, so the focus was on inequality, particularly in rural areas and poor communities. However, the main government response involved a system of *subsidies* in the form of the American Recovery and Reinvestment Act of 2009. Although not industry-specific, this legislation earmarked US$7.2 billion in stimulus funding for broadband internet access and projects. These funds were channeled through two programs, with more general type projects in a Broadband Technology Opportunities Program (BTOP), implemented through the Department of Commerce, and programs for rural areas implemented through the Department of Agriculture's Broadband Initiative Program (BIP). In addition, Congress mandated a national broadband plan, an international benchmarking, and a national broadband map that described the broadband capacities around the country. BTOP awarded grants to new and established service providers and offered grant terms and regulations more attractive to new carriers, with the goal of deepening competition in broadband infrastructure. More than 250 awards were made across all fifty states through BTOP sponsorship of basic infrastructure construction, community computing

centers, and community interventions. BIP focused on grant and loan combinations to established service providers. However, public investment represents only a small fraction of the total investments needed, so its net impact was small. It was further diluted by being sprinkled across the entire country, and much of it went to incumbents who would often have made the investments anyway. Federal monies did not necessarily reach areas of high need. New York, for example, despite its large rural and mountainous areas, economically stagnant upstate, and large low-income population, hugely underperformed in receiving broadband upgrade grants. At that time, New York was the third largest state by population, but it ranked twenty-first in terms of grant funding received. It had 6.1 percent of the nation's population but received only 2.2 percent of grant money. In terms of actual dollars, New York received less funding than the tiny state of Vermont. Program administration was weak, and the result analysis was virtually nonexistent. This plan benefited some, but it did not seem to have had a significant effect on national infrastructure or the health of the InfoTech industry. Thus neither the subsidy model nor demand-stimulation nor pro-competition policies had a significant impact on the InfoTech sector.

The Future of Macroeconomic Policy Tools

And what about macroeconomic policies through the banking system? Information and money go hand in hand. From the days of the telegraph, and even before, InfoTech has been integral to the financial sector. Any change in the technology of information distribution affects money, and any change in financial instruments affects the ability of governments to manage the financial economy.

Today the emergence of encrypted and decentralized e-money will affect the ability of governments to conduct monetary policy. Monetary policy is conducted through central bank control of short-term interest rates, the money supply, the relending by banks (the reserve requirements), and reporting requirements. With electronic money rising, these tools all carry question marks.

The central bank system is based on the ability to control interest rates. E-money reduces the demand for liabilities—that is, of public debt—issued by the central bank and, therefore, its ability to control liquidity through open market operations.

Mobile payment accounts will not simply be debit accounts but also credit accounts. In other words, they will create credit, especially microcredits, which will expand the supply of money. Demand deposits are affected by individuals depositing money in their mobile accounts or depositing it instantly in other

jurisdictions. By moving money to nonbanks, e-finance reduces the type of deposits that are subject to reserve requirements, leaving less and less for central banks to control.

There is also a deterritorializing of money. Already, for the U.S. dollar, three-quarters of new cash is moving abroad. The privatization of money adds another dimension, the degovernmentalization of money. We return to an emergence of private monies outside of governmental fiat issuance. Current examples of this are cryptocurrencies, such as those based on blockchain arrangements, which exist outside of government controls. We will see new types of money and money creators. We will also see technical progress in that standardized and staid commodity—money—the emergence of smart money, money that can do things. Cash that pays interest. Cash that can deposit itself. Cash that can time its own spending. Some of this may be foreign, and some may be domestic.

Governments are losing control over money creation. The volume of cash is altered by stored value in mobile terminals. With widespread m-finance terminals in every pocket, pocketbook, and automobile, the volume of stored value dwarfs the actual currency in circulation. In addition, e-money is created endogenously by economic activity and is, therefore, procyclical, rather than anticyclical, exacerbating instability.

Furthermore, the velocity of financial flows is enormously accelerated. Once individuals have money stored on or controlled by their phone, they may program it to seek the bank that pays the highest rate of interest. If Bank 1 in Country B raises its interest rate slightly, billions of cell phones around the world might shift money to that particular bank and to that particular country, and, as that happens, major instabilities will emerge.

Offshore tax havens and shadowy cyberbanks will emerge and become much more accessible. Reduction of the cash economy will reduce tax cheating, but the abilities to shift money, to hide money, and to anonymize money will grow exponentially. There will also be issues with reserve requirements, such as deposit insurance.

When money is deterritorialized from an actual economy, much of it beyond regulation, and with money being able to move instantly to other countries, the ability of governments and central banks to control the money supply and the macroeconomy is reduced.

The Need for New Thinking

What we witnessed in 2001 was that the new economy—dot-coms, InfoTech companies, app sites, telecom entrants, new media companies, e-commerce sites, et cetera—became an old-style bust. Collectively, in the United States

alone, investors lost approximately US$3 trillion. The Enron scandal was, in comparison, peanuts.

It was also the collapse of an intellectual atmosphere in which mindless hype was left unchallenged: how digital bits play by different economic rules than physical atoms, how the silicon economy is different from the carbon one, and how a price-earnings ratio need not have any E that stands for earnings. Yet these analysts of the ICT sector were not alone in donning rose-colored glasses. A few years later, other subdisciplines of economics also failed in anticipating deep problems in their areas, whether in real estate, banking, or macroeconomics.

Where was adult supervision in all this—the journalists, the academics, the rating agencies? When it comes to the dot-com crisis, the economics and policy research community performed terribly in interpreting or anticipating almost anything dealing with the internet and its business. We might consider why that has been so. The internet had many of its origins in the university community, and its early critical mass rose among researchers and students. The academic community viewed it, rightly, with some parental pride, and, like most parents, suspended some critical judgment. There was also a generational gap at work. The younger generation saw it as a means to leapfrog its seniors; experience seemed to matter little in an environment where the rules were all new. The elder generation feared being seen as obsolete and pulled their punches. Other academics became bogged down in the relatively small issues of domain names and flat rate pricing, laudable but narrow. If there was one societal-oriented criticism of the internet from academia, it was that there was not enough of it—the digital divide. This was something that leftist reformers and rightist business tycoons could agree on.

In conclusion, the great advances in technology and entrepreneurship led to a collective enthusiasm that was reflected by exuberant stock market valuations. Our view of the future of society and economy in the information age was shaped by various purveyors of hype in industry, academia, the press, and government. They painted a vision of a world in which all mankind would be linked and well informed, in which information would conquer illness, ignorance, and poverty, and in which economic prosperity, technological innovation, and political democratization would thrive. How wonderfully inspiring—and how naïve. No wonder danger signals were missed and policymakers were left unprepared.

There is more trouble ahead. The various subindustries of the information sector affect each other more and faster than before. Therefore, as countries become information-activity-based societies, they also become more volatile economies. The information industries will go through boom-bust cycles, of which we have merely experienced the first. There will be greater instability and fewer effective tools to deal with it.

Academic researchers failed in the dot-com and InfoTech bubble and in the real estate and financial bubble. We suspended our critical faculties and lost our detached skepticism. Having absorbed these lessons, it is time for the academic community to become less like cheerleaders and more like thought leaders, to understand the fundamental factors at work, and to establish new analytical theories and policy tools for the information economy.