An Evolutionary Approach to Financial History

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Financial history is not conventionally thought of in evolutionary terms, but it should be. Traditional ways of thinking about finance, dating back to Hilferding, emphasize the importance of concentration and economies of scale. But these approaches overlook the rich “biodiversity” that characterizes the financial world. They also overlook the role of natural selection. To be sure, natural selection in the financial world is not exactly analogous to the processes first described by Darwin and elaborated on by modern biologists. There is conscious adaptation as well as random mutation. Moreover, there is something resembling “intelligent design” in finance, whereby regulators and legislators act in a quasidivine capacity, putting dinosaurs on life support. The danger is that such interventions in the natural processes of the market may ultimately distort the evolutionary process, by getting in the way of Schumpeter’s “creative destruction.”

It is commonly said that finance has a Darwinian quality. “The survival of the fittest” is a phrase that aggressive market participants like to use; in the days before they themselves were rendered extinct, investment banks used to hold conferences with titles such as “The Evolution of Excellence.” The financial crisis that began in August 2007 has increased the frequency of such language. U.S. Assistant Secretary of the Treasury Anthony W. Ryan was not the only person to talk in terms of a wave of financial extinctions in the second half of 2007. Andrew Lo, director of the Massachusetts Institute of Technology’s Laboratory for Financial Engineering, is in the vanguard of an effort to reconceptualize markets as complex, adaptive systems similar to those we encounter in the natural world. A recent long-run historical analysis of the development of financial services also emphasizes the role of evolutionary forces in financial history (Ferguson and Wyman 2007).

The notion that Darwinian processes may be at work in the economy is not new, of course. In *On the Origin of Species*, Darwin himself explicitly acknowledged his debt to Malthus’s *Essay on the Principle of Population* (1798). As Darwin put it, the observation of Victorian capitalism had left him “well prepared to appreciate the struggle for existence...it at once struck me that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed. Here, then, I had at last got a theory by which to work” (Darwin 1859). Unscientific applications of Darwinian terminology to social problems led down many blind alleys, notably biological racism and eugenics. But evolutionary economics has managed to establish itself as a respectable if minor subdiscipline, which has had its own dedicated journal for the past 17 years, the *Journal of Evolutionary Economics*.

Thorstein Veblen first posed the question “Why Is Economics Not an Evolutionary Science?” (implying that it really should be) more than a century ago (Veblen 1898). In a famous passage in his *Capitalism and Democracy*, which could equally well apply to finance, Joseph Schumpeter

characterized industrial capitalism as “an evolutionary process”:

This evolutionary character...is not merely due to the fact that economic life goes on in a social and natural environment which changes and by its change alters the data of economic action; this fact is important and these changes (wars, revolutions and so on) often condition industrial change, but they are not its prime movers. Nor is this evolutionary character due to quasi-autonomic increase in population and capital or to the vagaries of monetary systems of which exactly the same thing holds true. The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers’ goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates. ...The opening up of new markets, foreign or domestic, and the organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the same process of industrial mutation—if I may use the biological term—that incessantly revolutionizes the economic structure *from within*, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism (Schumpeter 1987 [1943], pp. 80–84).

Seminal works in the nascent field of evolutionary economics include Alchian (1950) and Nelson and Winter (1982). Lo’s recent research on hedge funds illustrates the potential benefits of importing evolutionary concepts to the realm of finance. In Lo’s words, “Hedge funds are the Galapagos Islands of finance... The rate of innovation, evolution, competition, adaptation, births and deaths...occurs at an extraordinarily rapid clip” (Economist 2008).

CREATIVE DESTRUCTION

A key point that emerges from recent research is just how much creative destruction goes on in a modern economy. Approximately one in 10 U.S. companies disappears

each year. Between 1989 and 1997, to be precise, 611,000 businesses vanished annually, on average, out of a total of 5.73 million firms. Ten percent is the average extinction rate, it should be noted; in some sectors of the economy, it can rise to as high as 20% in a bad year, as in the District of Columbia's financial sector in 1989, at the height of the savings and loans crisis (Ormerod 2005, pp. 180–182). According to the U.K. Department of Trade and Industry, 30% of tax-registered businesses in Britain disappear after just 3 years (Guthrie 2007).

Even if they survive the first few years of existence and go on to enjoy great success, most firms eventually fail. Of the world's 100 largest companies in 1912, 29 were bankrupt by 1995, 48 had disappeared, and only 19 were still in the top 100 (Hannah 2009). Given that a good deal of what banks and stock markets do is to provide financial services to nonfinancial companies, we should not be surprised to find a similar pattern of creative destruction in the financial world. Between one-third and one-half of all hedge funds extant in early 2007 had vanished by the end of 2009. The only reason that more banks do not fail is that they are explicitly or implicitly protected from collapse by governments.

FINANCIAL EVOLUTION AND DARWINIAN EVOLUTION: COMMON FACTORS

What are the common features shared by the financial world and a true evolutionary system? As previously proposed in Ferguson (2008), there are at least six:

- “Genes,” in the sense that certain business practices perform the same role as genes in biology, allowing information to be stored in the “organizational memory” and passed on from individual to individual or from firm to firm when a new firm is created.
- The potential for spontaneous “mutation,” usually referred to in the economic world as innovation and primarily, although by no means always, technological.
- Competition among individuals within a species for resources, with the outcomes in terms of longevity and proliferation determining which business practices persist.
- A mechanism for natural selection through the market allocation of capital and human resources and the possibility of death in cases of underperformance, i.e., “differential survival.”
- Scope for speciation, sustaining biodiversity through the creation of wholly new “species” of financial institutions.
- Scope for extinction, with species dying out altogether.

Financial history is essentially the result of institutional mutation and natural selection. Random “drift” (innovations/mutations that are not promoted by natural selection, but just happen) and “flow” (innovations/mutations that are caused when, say, American practices are adopted by Chinese banks) play a part. There can also be “coevolution,” when different financial species work and adapt together (such as hedge funds and their prime brokers). But market selection is the main driver. Financial organisms are

in competition with one another for finite resources. At certain times and in certain places, certain species may become dominant. But innovations by competitor species, or the emergence of altogether new species, prevent any permanent hierarchy or monoculture from emerging. Broadly speaking, the law of the “survival of the fittest” applies. Institutions with a “selfish gene” that is good at self-replication (and self-perpetuation) will tend to endure and proliferate (Dawkins 1989).

Note that this may not result in the evolution of the perfect organism. A “good enough” mutation will achieve dominance if it happens in the right place at the right time, because of the sensitivity of the evolutionary process to initial conditions; i.e., an initial slim advantage may translate into a prolonged period of dominance, without necessarily being optimal. It is also worth bearing in mind that in the natural world, evolution is not progressive, as used to be thought (notably by the followers of Herbert Spencer). Primitive financial life-forms are not condemned to oblivion, any more than are the microscopic prokaryotes that still account for the majority of earth's species. Evolved complexity protects neither an organism nor a firm against extinction—the fate of most animal and plant species.

The evolutionary analogy is, admittedly, imperfect. When one organism ingests another in the natural world, it is just eating, whereas in the world of financial services, mergers and acquisitions can lead directly to mutation. Among financial organisms, there is no counterpart to the role of sexual reproduction in the animal world (although demotic sexual language is often used to describe certain kinds of financial transactions). Most financial mutation is deliberate, conscious innovation, rather than random change. Indeed, because a firm can adapt within its own lifetime to change going on around it, financial evolution (like cultural evolution) may be more Lamarckian than Darwinian in character. Two other key differences are discussed below. Nevertheless, evolution certainly offers a better model for understanding financial change than any other we currently have. The vogue for “behavioral finance,” which draws on insights from the field of psychology, represents a welcome corrective to the unrealistic assumptions made by neoclassical models, with their utility-maximizing rational actors. But the behavioralists have little to say about the way economic institutions evolve. The tendency (see, e.g., Thaler and Sunstein 2008) is to regard institutions as exogenous frameworks that an enlightened government can modify to take better account of the nonrational biases of individual psychology.

CONCENTRATION VERSUS SPECIATION

How do financial institutions evolve? Ninety years ago, the German socialist Rudolf Hilferding predicted an inexorable movement toward more concentration of ownership in “finance capital” (Hilferding 2006 [1919]). The conventional view of financial development does indeed see the process from the vantage point of the big, successful survivor firm. In Citigroup's official “family tree,” numerous small firms—dating back to the City Bank of New York, founded in 1812—are seen to converge over time on a common “trunk,” the present-day conglomerate.

However, this is precisely the wrong way to think about financial evolution over the long run, which *begins* at a common trunk. Periodically, the trunk branches outward as new kinds of banks and other financial institutions evolve. The fact that a particular firm successfully devours smaller firms along the way is more or less irrelevant. In the evolutionary process, animals eat one another, but that is not the driving force behind evolutionary mutation and the emergence of new species and subspecies. The point is that economies of scale and scope are not always the driving force in financial history. More often, the real drivers are the process of speciation—whereby entirely new types of firms are created—and the equally recurrent process of creative destruction, whereby weaker firms die out.

Take the case of retail and commercial banking. Although giants like Citigroup and Bank of America exist (just), the United States and some European countries still have relatively fragmented retail banking sectors. The cooperative banking sector has seen the most change in recent years, with high levels of consolidation (especially following the savings and loans crisis of the 1980s), and most institutions moving to shareholder ownership. For a time, it seemed that the state-owned bank might become extinct in the developed world, as privatization spread from Britain to most major financial systems. But the financial crisis of 2007–2010 revived the species, as a wide range of excessively leveraged banks passed into government hands, beginning with Northern Rock in England. In other respects, the story is one of speciation, in other words, the proliferation of new types of financial institution, which is just what we would expect in a truly evolutionary system. Many new “mono-line” financial services firms have emerged, especially in consumer finance. A number of new “boutiques” now exist to cater to the private banking market. Direct banking (telephone and Internet) is another relatively recent and growing phenomenon. Likewise, even as giants have formed in the realm of investment banking, new and nimbler species—such as hedge funds and private equity partnerships—have evolved and proliferated. Finally, the rapidly accruing hard currency reserves of exporters of manufactured goods and energy are producing a new generation of sovereign wealth funds.

Not only are new forms of financial firm proliferating, so too are new forms of financial asset and service. In recent years, investors’ appetite has grown dramatically for mortgage-backed and other asset-backed securities. In January 2008, there were 12 triple A-rated companies in the world but no fewer than 64,000 structured finance instruments, such as collateralized debt obligations, with the same maximum rating. Such instruments were virtually unknown 20 years ago. The use of derivatives has also increased enormously, with the majority being bought and sold “over the counter,” on an ad hoc one-to-one basis, rather than through public exchanges, a tendency which, although profitable for the sellers of derivatives, proved to have unpleasant as well as unintended consequences when a crisis struck that caused a large number of options to be exercised all at once. Seven years ago, there were less than \$3 trillion of credit default swap contracts outstanding; today, according to the International Swaps and Derivatives Association, there are more than \$25 trillion.

In evolutionary terms, then, the financial services sector appears to have passed through a 20-year “Cambrian explosion,” with existing species flourishing and new species increasing in number. As in the natural world, the existence of giants has not precluded the evolution and continued existence of smaller species. Size is not everything, in finance as in nature. Indeed, the very difficulties that arise as publicly owned firms become larger and more complex—the diseconomies of scale associated with bureaucracy, the pressures associated with quarterly reporting—provide opportunities to new forms of private firms. What matters in evolution is not your size or (beyond a certain level) your complexity. All that matters is that you are good at surviving and reproducing your genes. The financial equivalent is being good at generating returns on equity and generating imitators using a similar business model.

In the financial world, mutation and speciation have usually been evolved responses to the environment and competition, with natural selection determining which new traits become widely disseminated. Sometimes, as in the natural world, the evolutionary process has been subject to big disruptions in the form of geopolitical shocks and financial crises. The difference is, of course, that whereas giant asteroids (such as the one that eliminated 85% of species at the end of the Cretaceous period) are exogenous shocks, financial crises are endogenous to the financial system. The Great Depression of the 1930s and the Great Inflation of the 1970s stand out as times of major discontinuity, with “mass extinctions” such as the bank panics of the 1930s and the savings and loans failures of the 1980s. A comparably large disruption has clearly occurred in our time. The sharp deterioration in credit conditions in the summer of 2007 created acute problems for many hedge funds, leaving them vulnerable to redemptions by investors. But a much more important feature of the current crisis was the pressure on banks and insurance companies in the major developed economies. Estimated losses on asset-backed securities and other forms of risky debt are in excess of \$1.5 trillion for American and European banks. In May 2009, the U.S. government’s “stress tests” estimated American bank losses at approximately \$600 billion. The equivalent figures for the United Kingdom and continental Europe were comparable in magnitude. These losses were concentrated in a relatively small number of very large banks that had become heavily involved in the market for securities and derivatives, whose value was closely linked to that of U.S. house prices. By September 2009, U.S. banks had raised capital equivalent to approximately \$431 billion, leaving a shortfall of more than \$150 billion. Because banks typically target a constant capital/assets ratio of between 5% and 10%, this implies that balance sheets may need to be shrunk by between \$750 billion and \$1.5 trillion.

The financial crisis has dashed the hopes of those who believed that the separation of risk origination and balance sheet management would distribute risk optimally throughout the financial system. At the time of writing, the situation of the U.S. banking system remains parlous. In 2009, total lending by U.S. banks fell by 7.4%, the steepest drop since 1942, a far more serious contraction than in 2007, when the

phrase “credit crunch” came into common parlance. The credit withdrawn from the economy since the downfall of Lehman Brothers in September 2008 amounts to approximately \$700 billion, more than double the amount so far distributed under President Barack Obama’s \$787 billion fiscal stimulus program. Nor is there any sign of an end to the banking crisis, as rising defaults in the residential and commercial real estate sectors impact on the balance sheets of smaller regional and local banks. According to the Federal Deposit Insurance Corporation, the number of U.S. banks at risk of failing was 702 in the spring of 2010, its highest level in 16 years. More than 5% of all bank loans are at least 3 months past due, the worst figure in 26 years.

It seems inconceivable that this crisis will end without further mergers and acquisitions, as the relatively strong devour the relatively weak. There may also be more outright extinctions. The investment banks no longer exist: Of the five biggest, Lehman failed, Bear Stearns and Merrill Lynch were bought, and Morgan Stanley and Goldman Sachs had to become bank holding companies. Little now remains of the conduits and structured investment vehicles created by banks to hold assets off their own balance sheets. Bond insurance companies, too, seem likely to disappear. Many hedge funds have failed in the past 3 years; funds of funds are also struggling. But some hedge funds have been thriving on the return of volatility.¹ It therefore seems likely that a few large winners will emerge from the crisis in dominant positions within the “alternative investment” sector. The same may be said of private equity and venture capital. It also seems probable that new forms of financial institution will spring up in the aftermath of the crisis. As Andrew Lo has suggested, “As with past forest fires in the markets, we’re likely to see incredible flora and fauna springing up in its wake” (Economist 2008).

INTELLIGENT DESIGN

There is another big difference between nature and finance. Whereas evolution in biology takes place in the natural environment, where change is essentially random (hence Dawkins’s image of the blind watchmaker), evolution in financial services occurs within a regulatory framework where—to borrow a phrase from anti-Darwinian creationists—“intelligent design” plays a part. Sudden changes in the regulatory environment are rather different from sudden changes in the macroeconomic environment, which are analogous to environmental changes in the natural world. The difference is once again that there is an element of endogeneity in regulatory changes, because those responsible are often “poachers turned gamekeepers,” with a good insight into the way that the private sector works. The net effect, however, is similar to climate change on biological evolution. New rules and regulations can make previously “good” traits suddenly disadvantageous. The rise and fall of savings and loans, for example, was due in large measure to changes in the regulatory environment in the

United States. Regulatory changes in the wake of the 2007 crisis may have comparably unforeseeable consequences.

The primary focus of most regulators is to maintain stability within the financial services sector, thereby protecting the consumers whom banks serve and the “real” nonfinancial economy that the industry supports. Companies in manufacturing are generally less systemically important to the economy as a whole because it is banks and other financial companies that create both money and credit. The collapse of a major commercial bank, in which retail customers lose their deposits, is therefore an event that any regulator (and politician) wishes to avoid at all costs. An old question that has raised its head since August 2007 is how far guarantees to bail out banks create a problem of “moral hazard,” encouraging excessive risk-taking on the assumption that the state will intervene to avert illiquidity and even insolvency if an institution is considered too big—meaning too politically sensitive or too likely to bring a lot of other firms down with it—to fail. In the words of Federal Reserve Chairman Ben Bernanke, “As the crisis has shown, one of the greatest threats to the diversity and efficiency of our financial system is the pernicious problem of financial institutions that are deemed ‘too big to fail.’ It is unconscionable that the fate of the world economy should be so closely tied to the fortunes of a relatively small number of giant financial firms” (<http://www.reuters.com/article/idUSTRE62J0SM20100320>).

This is certainly correct from an evolutionary perspective. It is in fact highly undesirable to have any institutions in the category of “too big to fail,” because without occasional bouts of creative destruction, the evolutionary process will be thwarted. The experience of Japan in the 1990s stands as a warning to legislators and regulators that an entire banking sector can become a kind of economic dead hand if insolvent institutions are propped up despite economic failure and bad debts are not written off (Ferguson 2009).

CONCLUSION

Every shock to the financial system must result in casualties. Left to itself, “natural selection” should work fast to eliminate the weakest institutions in the market, which are typically devoured by the successful. But most crises also usher in new rules and regulations, as legislators and regulators rush to stabilize the financial system and to protect the consumer/voter. The critical point is that the possibility of extinction cannot and should not be removed by excessively precautionary rules. As Joseph Schumpeter wrote more than 70 years ago, “This economic system cannot do without the *ultima ratio* of the complete destruction of those existences which are irretrievably associated with the hopelessly unadapted.” This meant, in his view, nothing less than the disappearance of “those firms which are unfit to live” (Schumpeter 1934). It would be highly beneficial to legislators, regulators, and financiers themselves if, in the wake of this most recent crisis of our financial system, they came to terms with the evolutionary character of financial history and ceased their efforts to suppress the process.

This is not to say that it would have been better to repeat the experience of the Great Depression, when the number

¹In Andrew Lo’s words, “Hedge funds are the Galapagos Islands of finance... The rate of innovation, evolution, competition, adaptation, births and deaths, the whole range of evolutionary phenomena, occurs at an extraordinarily rapid clip.”

Figure 1. The number and assets of U.S. state and national banks, 1896–1941 (see Bodenhorn 2006).

of banks in the United States fell by more than half (see Fig. 1). Timely and large-scale action by the Federal Reserve and the U.S. Treasury succeeded in preventing a repeat of the early 1930s, so that the number of banks that failed in the more recent crisis was far smaller, as was the associated reduction in bank assets, i.e., credit (see Fig. 2). The problem is that such interventions have unintended consequences. Although the number of “problem institutions” in the FDIC database rose sharply in 2008 and especially in 2009, the number of mergers declined and the number of new charters fell to just 31 in 2009, compared with an average of 150 a year between 1990 and 2006 (Fig. 3). Any regulatory reforms that discourage the creation of new financial institutions will be deleterious to the long-term health of the U.S. economy.

A final pitfall that regulators must avoid is the notion that there is an ideal financial system toward which all countries are converging and which it is the duty of regulators to promote. A large literature on the relationship between law and finance encouraged the notion that there was a superior common law model that offered creditors better protection and therefore increased financial intermediation (see, e.g., La Porta et al. 1998). There is in fact some reason to doubt that this hypothesis is supported by the data that we have on creditor protection in different legal systems in the 19th century (Musacchio 2009). The historical record points to considerable diversity in the way that the financial systems of different national economies evolved (see Cameron 1972). In some countries, bank finance predominated over bond finance and stock

Figure 2. The number and assets of U.S. commercial banks, 1979–2009. Source: <http://www.fdic.gov/bank/statistical/stats/>.

Figure 3. Changes in FDIC-insured financial institutions as percentage of total number of institutions. Source: <http://www.fdic.gov/bank/statistical/stats/>.

markets scarcely had any role; in others, the opposite was true. In some countries, the banking sector became highly concentrated relatively early; in others, it remains highly decentralized to this day.

If evolutionary theory has one obvious lesson for financial regulators, it may well be that diversity is desirable in finance as well as in nature. Were the whole world to converge on a template—whether it was devised in Washington, Basel, or Beijing—the international system would be considerably more vulnerable to a mass extinction than it presently is.

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Cold Spring Harbor Symposia on Quantitative Biology

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Cold Spring Harb Symp Quant Biol 2009 74: 449-454 originally published online May 27, 2010
Access the most recent version at doi:[10.1101/sqb.2009.74.050](https://doi.org/10.1101/sqb.2009.74.050)

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