

Thought Contagions in Deflating and Inflating Phases of the Bubble

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Thought contagions are ideas that cause their own propagation, often because of the nature of what is believed. The transmission and retransmission of these ideas falls into the very broad class of replication processes. While large-scale phenomena such as spreading currency devaluations may be regarded as *macro-contagions*, thought contagions include many *micro-replication processes*, or *micro-contagions*. Whereas various types of social replication warrant study, the study of thought contagions focuses on the micro-contagion of ideas, or, more technically, the micro-replication of ideas.

Both inside and outside of finance, thought contagions have touched the lives of virtually everyone smart enough to learn simple ideas from others, whether they have completed graduate school or only pre-school. While many thought contagions involve ordinary or innocuous topics, fantastic ideas and beliefs that intensely affect adherents' lives have long demonstrated exceptional abilities to spread themselves without evidence. For example, the idea of empire-building has spread as a long slow thought contagion for hundreds of generations. Conquerors spread their ideas of conquest, and reasons for doing it to the conquered peoples. People far removed from the action eventually received the ideas as well, since they were often vivid enough to provoke many retellings and eager learning. The overall process has played a central role in human affairs for thousands of years. In modern times, military and political calamities of the process sometimes send shock waves through world financial markets.

Other thought contagions are less dramatic, but humanity produces a huge array of extraordinary beliefs that spread nonviolently as thought contagions. This alone can lead to mass delusions. Our society even has thought contagions that specifically disparage good knowledge and education. For example, many students from grade school through college think of their school's more accomplished students as being squares, geeks, nerds, and so forth. As a result, they tend to avoid falling into that category by giving less

attention to their education, which allows them to spend more time socializing with their peers. The extra time they spend with peers then translates into extra time for spreading their derogatory ideas about those who do well in school. Long-term ostracism often results; leading to at least some self-fulfilling aspects of anti-educational thought contagions. Bullying and a corresponding "revenge of the nerds" impulse sometimes follow. We should note the anti-educational ideas apply not only to education obtained for motives that include grades, but also to the uncertified self-education of those who study out of curiosity. Although countermeasures can be developed against anti-educational thought contagions, their spread in recent decades has apparently contributed to diminishing various kinds of test-measured learning done by young people in the US. Thought contagions can favor underperformance in many settings, but the financial markets provide a huge array of examples that are often spectacular and well recorded.

One of these is the idea that computers would very soon achieve almost infinite possibilities by way of something called "the singularity." This theory holds that the frequent doubling of computing power would lead to computers becoming smarter than people and then designing their own next generations in ever shorter periods of time, leaving humanity far behind. All the "old rules" about social and technological change would have to be discarded, and humanity as we know it would end. The whole idea is vivid and gripping in its own right, and gives its adherents reasons to express it to anyone they care about. While a true mathematical singularity in computing power is physically impossible, immensely greater computing power may nevertheless arrive in the coming decades. However, the most infectious popular beliefs about "the singularity" have been ones holding that vastly superhuman intelligence would emerge as early as the 20th century or in the specific year 2002. These imminent singularity ideas were more vivid and provoked a greater sense of the need to tell others, so that life plans could be made accordingly.

As Internet use became mainstream, the propagation of this idea accelerated greatly. Those most interested in digital technology tended to disproportionately use the Internet, and to communicate their ideas on it. Ideas of a looming technological singularity thus began spreading far beyond an early circle of prognosticators.

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Alongside this idea of a singularity came the idea that the Internet itself would wake up and become a super-human intelligence in its own right—a view that the Internet would become a “global brain.” Internet visionaries began painting vivid scenarios of the billions of users and computers linking up and performing great intellectual feats much as the human brain performs mental tasks that greatly transcend the abilities of any one neuron.

There actually are some impressive technological changes developing that are likely to allow the web to handle new kinds of conveniences automatically. However, some of the communication changes are likely to facilitate and accelerate herding and contagion behaviors. For instance, technologies intended to help people copy the web paths that others have taken have been publicized as a basis for imminent arrival of a “global brain.” But when applied to thinking and decision-making, the recent web technologies are much more likely to usher in new heights of mass foolishness rather than to create any kind of super-human intelligence.

Ideas that humanity was about to be vastly transformed propagated due to their vividness and the way they motivated adherents to inform others before it was too late. The competing idea that the Internet could add more ways for us to achieve collective mass blunders was not terribly compatible with the outlook of accelerating progress, and so enjoyed little receptivity among those viewed as technology experts. These people were also less apt to form the idea in the first place. Likewise, such “experts” had little incentive to spread the idea that the subject of their expertise could have negative implications. Instead, they had more incentive to tout the wonders of the Internet. Thus, mundane views of the Internet were often out-propagated by the vivid, interesting stories of humanity crossing a great new threshold. The latter ideas captured the imagination of fairly ordinary users and inspired much conversation. They also had greater potential for winning book contracts, article royalties, and media interviews than did the more realistic views.

A good real-world demonstration that the “global intelligence” of millions of Internet users need not match, let alone exceed, the intelligence of a well-educated individual came with the forecasts of a great cataclysm due to year 2000 computer glitches. Message boards dedicated to the subject became predominated by forecasts of the end of the world as we know it. Doomsday web pages became vastly interlinked. As the new year arrived, it demonstrated that millions of people addressing a question collectively with the help of the Internet can produce a much worse answer than a single person doing good research at an old fashioned library. Wiring together millions of users can actually produce a worse result than letting people address the question without each other’s help.

While thought contagion theory helps explain why active masses underperformed qualified individuals, thought contagion analysis alone does not answer all the questions that large crowds try to address. Some thinking and investigation by people well versed in relevant technologies was still needed to assess how much trouble was likely to arise from the century rollover problem. Still, the fact that large, electronically linked masses of people performed so poorly on the year 2000 question did not stop the idea of an imminent global brain from spreading right into the next century. Whether future enhancements of web and Internet technology yield better results or even worse results remains to be seen, but our limited experience suggests that we exercise caution regarding speculation of an emerging super-intelligence in the Internet.

With people from all walks of life flocking onto the Internet, it did not take long for ideas of an imminent global brain or digital singularity to spread to those who were looking for new investment opportunities. Neither did it take long for some people to hold expectations that the Internet and other computer related technologies had vastly more lucrative futures than other investments. For example, ideas of a global brain or a singularity probably spread to at least some of the early venture capitalists, especially ones who were early adopters of Internet usage. At least some of them would naturally have seen their technological expectations as having enormous financial implications.

With such fantastic ideas for the future of digital technology spreading online, the idea of an unprecedented opportunity in the Internet stocks also began to spread. When investment in dot-coms and other Internet related firms began, beliefs in them became specific thought contagions in their own right. Most investors had not heard those fantastic ideas about an imminent singularity or a global brain, but they had heard other fantastic ideas that perhaps the whole future of business lay in the new technology companies, or that old rules of valuation no longer applied. Those who were most interested in the Internet companies tended to have more and faster ways to spread their beliefs electronically than did most other investors. This apparently started exerting a major effect on share prices in during 1998. For example, Amazon.com shares rose by more than 400% during the first 11 months of that year. With investors bidding the price up at such a phenomenal pace, it is reasonable to suppose that many investors expected the price to continue rising rapidly.

The stellar rise of the Internet companies quickly became a major news story. That, in turn, exposed still more people to the idea that Internet stocks were on a roll. It also created opportunities for analysts and brokerages to compete for the attention and the business that went with it by forecasting continued growth. By December of 1998, analyst Henry Blodget hoisted

himself out of obscurity by giving Amazon.com a price target that was 65% higher still, as documented in Howard Kurtz's book *The Fortune Tellers*. Blodget's forecast, coupled with the media attention it drew, had a self-fulfilling effect on the company's share price, which quickly rose by nearly 130 percent instead. After that, Merrill Lynch offered Blodget a high-profile job of trumpeting other Internet companies as well.

The media forecasts for Internet companies were in turn amplified by online communications, once again more intensely than for other investment sectors. With centralized dissemination, other people in the media, and often in the investment banking and brokerage businesses, quickly learned to compete for attention and business by voicing extremely inflated valuations for Internet stocks. While thought contagions among individuals on the Internet had played an important role before, the process became increasingly dominated by thought contagions among highly centralized communicators. The centralized communicators spread ideas to each other by their centralized media, while simultaneously spreading the same ideas to the general public. All of this drove share prices even higher.

Still, the early thought contagions and the emergence of a crowd infatuated with Internet stocks may have made it inevitable that someone like Blodget would come along in the early stages of the Internet bubble and help expand it further. If something unfortunate had happened to Blodget before he became an analyst, someone else who expected Internet stocks to make further rapid gains would probably have gained media attention and been hired to hype stocks for a major brokerage. The particular Internet companies touted may have been different, along with details of market timing, but the overall forces of mass psychology could very well have led to a similar bubble.

In addition to the early idea that the technology was crossing an important threshold came another vivid idea: that technology was leading human intelligence itself to cross a great new threshold. There emerged a belief that people in their early 20s or younger formed a new generation with special abilities to learn programming languages and other aspects of technology. Employers became major disseminators of this idea, because it allowed them to hire relatively low paid employees and then tout them as a wonderful new kind of human capital to customers and shareholders. For example, commercials by MCI-Worldcom claimed that they were now staffed with a so-called "generation-d," where the letter d stood for "digital." In reality, younger people, who usually have shorter psychological time horizons, are often less concerned about spending their time learning things that will be obsolete in a few years. Several years can seem an eternity to an adolescent much as an hour can seem eternal to a five year old. Many of the older people who remained active at learning new things might have shown a stronger pref-

erence for areas of knowledge that would remain useful in the long run. Being farther from retirement age, younger employees might also have been more willing to accept compensation in the form of stock options. They would also have had less knowledge and experience of worthless options.

Young people were often very receptive to the idea that they were a new kind of digitalized human. It was, after all, a rather flattering idea. They may also have been more active at expressing their beliefs than were older people, in which case the thought contagion probably would have spread vigorously among them. As the ideas spread through society, they may have contributed to the decisions of people ranging from venture capitalists to retirement investment clubs to place large sums of money in the hands of business people with little experience and relatively limited areas of expertise. In other words, people were abandoning the "old rules" of valuation for experience and extensive knowledge. Accordingly, "old rules" of valuing companies with a broad range of experience levels were also discarded.

As investment money poured into the hands of the youngest entrepreneurs, the IPOs and skyrocketing share prices created yet another thought contagion that reinforced earlier ones. Very young people were often turned into millionaires and even billionaires, at least on paper. In some cases, they were able to diversify into other lines of business before it was too late, by buying a basketball team, or merging with an old media conglomerate, for example. What is important from the financial perspective is that news stories about dot-com millionaires spread from one news writer to another, and that this further spread the notion that companies run by the very youngest digital entrepreneurs really were the very best investment opportunities. Additionally, many of these youth-operated start-up companies regarded job applicants as "old" if they were over 30. This tended to further concentrate the stock options and venture capital in the hands of young adults, so that young people had greatly disproportionate likelihood of becoming dot-com millionaires—again, at least on paper. Nevertheless, it further ensured that news stories about new dot-com millionaires would be skewed toward the youngest age brackets, and there emerged a self-fulfilling stereotype of the dot-com millionaire being very young. This would still further disseminate the idea that the least experienced entrepreneurs and employees made the best investment opportunities even for older investors.

Another new threshold idea was the belief that early adopters of the latest technology could call themselves the "digerati" and regard others as troglodytes. Those who had the idea were often eager to express it just to show that they had crossed at least a vocabulary threshold. The newly exposed often wanted to learn the word and the idea just to avoid

that troglodyte epithet. The idea had the distinct advantage that it could spread among people who were even older than the Internet. People who were once ostracized as nerds and geeks might also have been especially receptive to the idea, since it gave them a sense of having the last laugh. They could finally view themselves as top dogs in one of society's alternative status hierarchies, much as people steeped in hip-hop culture could. Some found themselves being relabeled as "cool" for achieving types of education that once brought scorn from their peers. The influx of investor money, the proliferation of employee stock options in overvalued companies, and massive financial publicity all helped. Those who saw themselves as "computer wizards" could start dismissing the views of others and assuming that their own ideas were automatically better, which helped preserve their ideas. It is worth noting that no word like "analogi" emerged to describe those who understood analog electronics, even though analog field effect transistors form the basis of present microprocessors.

Even senior officials, politicians, and company executives at the pinnacles of their careers felt popular pressure to refer to "the new economy" to indicate that they at least viewed business, if not the human mind, as crossing a new threshold. As a wide array of authorities started expressing the various threshold ideas, conformity pressure on average people grew, further raising receptivity and prevalence of the ideas. Many people over the past century have tried to avoid the stigma of being seen as out-dated by others.

Authors and self-promoters quickly discovered the wide interest in staying cyber-trendy, and further disseminated the "digerati" idea and related concepts to the public and each other by numerous media. The books, lectures, articles, new magazines, consultations and so forth proved lucrative enough to keep many of them going. As the "digerati" idea spread, it further increased interest in the Internet among stock market and venture capital investors. It also magnified the impression that one could casually turn over funds to people who appeared to understand the technology.

In the talk I gave in December 1999, Aspen Conference, Institute for Psychology and Financial Markets, I discussed many of the other possible thought contagion factors driving the Internet bubble, so there is no need to reiterate them. I also listed many contagion factors that would lead to the decline of that bubble, and the decline began in earnest about four months later. Today, many dot-com companies have in fact lost all of their contagion-driven overvaluation, since many of them are now defunct. Yet part of what has happened during the so called dot-com meltdown is that some of the true believers did not leave the market but instead transferred their investments to companies that were making at least some money, or that at least had some hope of eventual profitability left.

For example, AOL, which has now merged with Time-Warner, can hope to profit as a media conglomerate even if the online business eventually fails. It has retained a huge market capitalization even as other Internet businesses folded. Moreover, eBay, which has some profitability, still has a remarkably high Price to Earnings ratio, even after that ratio has fallen by more than eight-fold from its highs. Its market capitalization remains over 17 billion dollars, and the stock price has held more ground than most other dot-com companies. This suggests that while those expecting to make a fortune in a year or two may have left the dot-com sector, those who hold onto a longer-term belief in companies started within several years of the invention of graphical web browsing may view the dot-com meltdown as mainly a shakeout of the unprofitable companies rather than as a consequence of overvaluation.

Some of the same online contagion mechanisms that had helped the dot-com sector achieve astronomical valuations may also have continued favoring a handful of profitable dot-com companies even during the downturn of the sector as a whole. In the relatively technology-neutral forum *misc.invest.stocks*, eBay had 303 mentions during the year ending on April 25, 2001 while Exxon-Mobil had only 81 mentions. The continuation of its disproportionate presence in online communications might thus have helped to keep its price to earnings ratio more than ten times higher than the P/E ratio of the oil giant, even as oil became more profitable.

While the idea that the Internet was verging on superhuman intelligence may seem foreign to most people, it actually bears some similarity to an older belief in collective superhuman intelligence: the efficient market hypothesis. By taking the view that vast crowds of investors collectively discern the correct value of stocks and the risks associated with them, the Efficient Market Hypothesis is, in effect, the financial equivalent of belief in a global brain. One of the main differences, however, is that EMH holds that the collective intelligence of investors already exists, instead of looming just over the horizon.

Instead of offering a vivid, gripping image of impending change, EMH may have propagated in its early days by giving brokers, fund managers, and others a way to tell clients that the markets were much more precisely understood than they really were. Many adherents would thus have financial incentives for enunciating the idea that markets were efficient and well understood. For example, it may have given some fund managers a way of telling clients that the managers had an exact understanding of the markets, and that they, therefore were at least as qualified as anyone else to manage the clients funds. The more formally elaborated forms of EMH would also have allowed managers to imply that their new knowledge would protect against such notorious market losses such as those that

happened in 1929. EMH also provided some fund managers a way of telling clients that they were unlikely to lose their money to smarter people in the market, as an efficient market would give equal opportunity to all investors. It thus allayed one of the main fears that average investors might have about investing, particularly with the entry of many people who have full time non-financial jobs and other commitments that demand nearly all of their brainpower. Index funds might be particularly effective at allaying fears about being outsmarted by wiser or more diligent investors. Brokers and fund managers have also used EMH tenets to convince clients that losses or underperformance were just temporary statistical flukes rather than any reason to move money elsewhere.

Firms that gained business this way also had financial incentives to back scholars who supported EMH, and many scholars in turn may have realized that supporting EMH was a good way to attain funding from those firms. This might have provided a basis for the transmission and adoption of EMH in academic circles. Well-funded academic professionals tend to be imitated by more colleagues, as well as to gain more influence over teaching curricula. Likewise, graduates who got the highest paid jobs in business were emulated by more people than would those who did not quite fit the business needs of prospective employers.

EMH has also enjoyed transmissivity, receptivity, and longevity advantages from being a relatively simple hypothesis, at least as expressed in plain English. It enjoys some of its receptivity by seeming to be a logical extension of the adage that “two heads are better than one.” The extension being that a whole market full of thinkers must be wiser than any one investor. A similar intuitive receptivity to the idea that many heads are better than one may also favor the electronic global brain ideas now spreading on the Internet.

Back before serious research into investor psychology had started, the assumptions that investors were rational also provided a starting point from which elaborate mathematical models could be built. Elaborate mathematical models can be built from almost any starting assumptions, but it was natural that the development of models starting from simple assumptions about investor psychology would begin to develop before the models based on more complex but realistic assumptions about investor psychology. Having started earlier, the models based on simple assumptions would have had more years to become elaborated by theorists willing to accept the starting assumptions. Yet a large corpus of mathematical literature can provide refutation resistance to those who hold the corresponding hypothesis. Even people who had no idea what the equations said needed only to be aware of their existence in order disregard theory and data that contradicted mathematically expressed conclusions. It would take such a long and elaborate critique to address the body of work

built upon rational agents tenets that it may be very difficult to shake the belief of a staunch believer who never understood the math in the first place. Mathematical models have also been developed in behavioral finance, but with models postulating rational agents having had more years of development, there could easily have been a larger body of mathematics done on behalf of EMH.

Most non-mathematicians have no idea how to discern whether one body of equations and postulates is better than another. The mathematicians available to check the uses, misuses, and outright abuses of applied mathematics are few enough that limits in reading speed alone make the effort prohibitive. Faced with oceans of unchecked math and often flawed premises, non-mathematicians might judge financial ideas simply by considering how many equations there are, how complex they appear to be, how many authors there are, their levels of personal prestige, institutions, and so forth. So once an adherent of EMH became sufficiently aware of all the mathematical and quantitative work done on behalf of EMH, he or she would therefore have had a cognitive mechanism that could help preserve belief in EMH in the face of challenges. Such challenges included those coming from data, research, and the arguments of colleagues who disagreed. Preserving belief against such challenges would have kept believers spreading EMH for a longer time to new people.

With the spread of elaborated forms of EMH came a view that the markets were well understood and quantitatively analyzed by the best and brightest minds available. This idea may have calmed some investor's fears of losing money to smarter investors or that long-term losses could ever affect their investments. It might, therefore, have played some role in the long rise of price to earnings ratios that has happened from 1982 to early 2000.

The book *When Genius Failed: The Rise and Fall of Long Term Capital Management* by Roger Lowenstein confirms the high receptivity given to bad ideas expressed mathematically, especially when Nobel Laureates are involved. Yet the prestige system can have self-sustaining elements strong enough to promulgate bad ideas, since the existing elites often have enough collective power to choose the majority of their successors to elite status. But people who regard themselves as geniuses often have so much overconfidence that they do not question and improve their own beliefs. Many also dismiss the ideas of people they regard as lesser geniuses, even if the latter have spent far more time thinking about something. Those who have done more thinking may therefore simply avoid challenging beliefs of those who are unshakably convinced that all their ideas are superior. Belief in the *inherently* superior thinking of geniuses can thus slow one's learning from others and impair one's thinking. This can pre-

serve the misguided belief itself, but it can also preserve bad ideas about all sorts of other subjects—including finance. All these well-preserved delusions then have more time to spread to new people and more time to become the basis of disastrous business plans.

Other long term trends brought on by thought contagions in society may also have contributed to the unusual length of the US stock market bubble. These include ideas about subjects other than finance. One example, pointed out by Robert Shiller in his book *Irrational Exuberance*, is an increase in materialism since the early 1980s.

Still another possible long-term contagion effect in the recent bubble is the effect that optimism can have on people's behavior. Those who feel most optimistic about their portfolios, for instance, might be the most over-confident investors. Yet a high level of over-confidence could cause people to express their ideas more frequently and confidently to others. That could lead optimistic, over-confident investors to spread their opinions about the market's future more often than do people holding more realistic opinions. Optimism based on extremely long term assumptions can actually verge on a belief in the financial afterlife. As such, it may confer dropout prevention as long as earnings are growing. One-sided optimism about the overall stock market also attracts millions of book buyers. In populations of amateur investors, one-sidedly optimistic ideas about stocks can exhibit a simplicity that makes them easy to learn, easy to express, and easy to remember—all of which favors outbreaks of simple but optimistic thought contagions in word of mouth and online discussions of stocks.

Although general economic ideas such as EMH or optimism might have contributed to long-term bubble development, more immediate economic ideas apparently contributed to the idea that the economy was either in recession or entering recession. The way this works is similar to the way clothing fashions spread. When a novel fashion starts to spread, those who have it receive more attention than those who don't. That alone can cause more imitation. But people also crave attention; giving them an incentive to adopt the novel fashion they have seen. But once the fashion becomes commonplace, it no longer commands attention, leaving its adherents susceptible to the next fashion conta-

gion to come along. Fashion moguls play their part, but many fashions start as grass roots thought contagions and are only later discovered by moguls. Many years later, when a fashion fades into distant memory and is completely unknown to a new generation, it once again can spread by commanding attention. Thus it is with the revival of Hush Puppies® or bell bottom blue jeans after long periods out of style.

With economic ideas, the concept that we are in or entering a recession likewise commands much more attention when it has fallen into long-term disuse. This apparently happened during the middle to late nineties. It created a condition where people could gain attention for themselves or their companies merely by using the so-called "R-word." In other words, it would not take much to set off a contagion of recessionary thinking. In November 2000, when George W. Bush began to refer to his tax cut plan as an economic recovery plan, it created an easy way for broadcasters, newspapers, writers, and so forth to gain attention by explicitly referring to recession. These centralized communicators then exhibited a thought contagion amongst each other, as their media output traveled instantly from one central communicator to another and was amplified many-fold by the huge audiences in the general public. Consumer confidence declined, and the recession talk either did become self-fulfilling or almost became self-fulfilling. The effect on stocks, however, was more complicated. The slowing growth rate and risk of recession caused the Federal Reserve to sharply cut interest rates, helping stock prices to rebound somewhat.

Companies also began imitated the idea of making public announcements that were timed to match the onset of recession talk. The announcement of previously withheld negative information by one company would lead others to copy the strategy, leading to some possible chain-reaction spread of the idea of announcing negative news. This tended to reinforce the spread of recessionary thoughts.

Financial thought contagion can thus exert an influence in both causing a bubble, making it deflate, and even in slowing down its deflation. While much research remains to be done in this field, it may turn out that the contagions in mass psychology along with the numerous influences of individual psychology add up to substantial forces affecting the financial markets.

