



SOCIETY OF ACTUARIES

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## THE IMPORTANCE OF MAKING THINGS MORE COMPLEX

By Steve Scoles

One of my favorite *Far Side* cartoons for illustrating man's difficulties in understanding financial markets features a very displeased dog owner chastising his dog over all of the things the dog has done wrong. The dog sits there smiling, loving all of the attention he's getting as the cartoon shows that all he hears is his name being repeated over and over again.

The key here is that the dog operates at a different level than the human. The dog doesn't understand English, so trying to explain something to the dog is futile. But this doesn't stop the owner in the cartoon (and many real-life dog owners) from behaving this way. They can't or don't want to see that the dog is operating at a simpler level than them. When it comes to financial markets, most participants don't see that the market is operating at a more *complex* level than themselves. It's often said that the market is "irrational." However, that kind of comment doesn't recognize the natural behavior of systems that have many interacting parts. These types of systems, called complex systems, are quite common in the natural world and can be useful in getting a better understanding of financial markets.

### COMPLEX SYSTEMS AND SAND PILES

Financial markets involve millions of interacting participants who are trying many different strategies. Many natural systems have similar underpinnings—a large number of interacting parts—such as the weather and ecosystems. These types of systems are called complex systems. There is a whole field of science that deals with these systems and finds a number of common features among them.

The first step in understanding complex systems is to look at the simple example of the dynamics of a growing sand pile. Imagine grains of sand being dropped on a flat surface. Gradually the grains build into a small pile. Then a small avalanche or two will happen that broadens the base of

the sand pile, allowing an ever larger sand pile to build. At some point, the pile is steep enough that the next grain of sand triggers a massive avalanche.

From the sand pile example, a couple of features of complex systems start to become clear. First of all, cause and effect are very difficult to determine. One grain of sand can start a massive avalanche or it may start no avalanche whatsoever. Rather than one grain of sand causing the avalanche, all of the other grain's interactions leading up to that point put the sand pile into a state such that any additional grain would cause a collapse. The state of the sand pile (e.g., its steepness) matters much more than any incremental grain of sand as far as what comes next.

A second, related, feature is that the sand pile dynamics are very non-linear. The action of an incremental grain can have anywhere from no effect to a large effect. That is, the input and output of the system have no proportional (i.e., linear) relationship. Rather than saying the sand pile avalanche is "irrational," we can see that its dynamics are the natural effect of all of the interacting forces at play.

### FINANCIAL MARKETS

To apply the complex systems ideas to financial markets, it's useful to look at another cartoon. In a cartoon by Robert Mankoff from the *New Yorker* in 1981, someone is watching the financial news as the TV anchor says:

"On Wall Street today, news of lower interest rates sent the stock market up, but then the expectation that these rates would be inflationary sent the stock market down, until the realization that lower rates might stimulate the sluggish economy pushed the market up, before it ultimately went down on fears that an overheated economy would lead to a reimposition of higher interest rates."

CONTINUED ON PAGE 20

While this seems quite funny, it's not far off the typical explanation of market movements. For example, here is a quote from Yahoo! Finance on Aug. 7, 2007 on a day when the market gyrated after a Federal Reserve announcement that their benchmark interest rate was left unchanged:

“Investors were at first deeply disappointed that policy makers ... did not provide any hints about a possible cut. But after digesting the policy statement, they quickly gained solace the economy is likely to withstand troubles in the mortgage industry.”

Much like the dog-owner talking to a dog at the owner's level, almost all financial market commentary is trying to treat markets at a human level. Rather than realizing the market is a complex system that has non-linear dynamics and where cause and effect are very difficult to link, a story is created to explain what is happening. With so many interacting parts, complex systems are rarely explainable through simple stories.

If creating a suitable story fails, then the default explanation is the market is being “irrational.” However, it's not the market that is being “irrational,” it's the treating of markets at a human level that is irrational.

### MARKET INCREMENTALISM

The typical attempt at explaining market behavior is based on what I call market incrementalism—the widespread, but false, belief that incremental news drives the financial markets.

An impressive example of the error of market incrementalism was the attempt at understanding market moves during the U.S. debt ceiling debate in the summer of 2011. As the deadline neared to raise the ceiling, there was a modest decline in the U.S. stock market. At that point, there were two views being expressed on financial television. The first, most common, view was that the market would fall drastically if the debt ceiling was not raised. The second view,

portrayed by a number of market “strategists” was that this was all just political posturing, that the debt ceiling would be raised, and thus this modest market decline was a “buying opportunity.”

When the debt ceiling was in fact raised, the U.S. stock market actually declined 15 percent in the next six market sessions! Instead of the U.S. debt debate mattering, perhaps the market fall was just the chaotic after-effects of the steep preceding two-year 100 percent rally in U.S. stock markets. The daily news is simply one of innumerable factors at play with financial markets. Everyday there are good news and bad news stories that can be selected from to explain market moves. In reality, the daily financial market commentary is much more about creating an illusion of understanding and control rather than being useful in helping people succeed in financial markets.

### THE GREAT MODERATION

The economy is another complex system. Up until the summer of 2008, it was very common for economists to talk about the “Great Moderation”—a lengthy period of reduced economic volatility due to economists having perfected their craft. (I'm not making this up!)

Recognizing markets and economies as complex systems, provides a much different light on what low volatility might mean. In the sand pile example the lack of volatility (i.e., a steadily growing pile) meant risk was building up. After the pile collapsed, i.e., after a period of extreme volatility, the risk of a further collapse was much lower.

In complex systems, what's happening on the surface can be a very misleading guide to what's happening under the surface. Said another way, in a complex system, the perception of risk and the reality of risk can be very far apart. The Great Moderation was a period when risk was rising. After the Great Moderation ended (and now into the “Great Volatility”) is a period of risk being reduced.

# // MUCH LIKE THE DOG-OWNER TALKING TO A DOG AT THE OWNER'S LEVEL, ALMOST ALL FINANCIAL MARKET COMMENTARY IS TRYING TO TREAT MARKETS AT A HUMAN LEVEL. //

## COMPLEX BETTER THAN SIMPLE


I have touched on just some of the ideas of complex systems and how they are a useful framework for understanding financial markets. One of the most valuable ideas is that most financial market commentary is simply not meaningful or not correct in understanding what's happening. Now if only I could find a way to understand my dog better.

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