COMPLEXITY, RISK, and FINANCIAL MARKETS

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EDGAR E. PETERS

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Preface

WE know that things are uncertain at times of crisis. Uncertainty disrupts financial markets. It induces mob behavior. People hate uncertainty. Often, there is a feeling that a conspiracy must be behind it all, organizing and disseminating the problems. Someone must be punished. The witches must be burned. The communist spies must be revealed. People begin looking for signs of the conspiracy, particularly events which, when connected, will reveal a tapestry of deception—a pattern that will be there for all to see.

If we look hard enough, we can always find a pattern. Experts will say that the "probability" that a particular connection might happen by chance is very small. Most of their readers or listeners will take the qualified statement as a proclamation of truth, though it is never made clear how probabilities for such events can be calculated. In retrospect, the conspiracies usually turn out to be deadly flights of the imagination. There are no witches. There was no communist conspiracy. Yet the patterns were there. What was it that we were seeing?

In nature and in social systems, there are many processes that self-organize; that is, independent elements spontaneously begin cooperating and acting as one entity without an organizer. In the weather, we see these processes as hurricanes or tornadoes. In social systems, they have been variously described as bull markets, the "invisible hand" of the free markets, or the madness of mobs. In the sciences, the study of *complex systems* has identified the characteristics of those natural processes that

self-organize, evolve, and adapt to changes in their environment. Thus, if social systems are complex, the vestiges of self-organization will look like a conspiracy. The links are there, but there is no planner, no mastermind behind the structure. What look like patterns are merely the shadows of complexity.

In the early twentieth century, a group of economists in Austria postulated a social system with characteristics similar to those of the process now described by complexity theory. The system was to consist of individuals who, while working in their own self-interest, would also cooperate because of overlapping goals and knowledge. Ultimately, this group of people would self-organize into a *free market system.* The Austrian economists followed a nonmathematical path because the processes they were describing could not be modeled by the mathematics available at the time.

The math is now available, and because the sciences of complexity can be applied directly to the Austrian school, we are better able to understand the workings of a free market. In particular, we can achieve a deeper understanding of uncertainty's role in a free market economy as well as in a free society. Uncertainty is not necessarily bad or synonymous with risk. Complex systems use uncertainty to their advantage as they adapt to changes in their environment and learn to be resilient to unexpected shocks. Uncertainty then, rather than being the source of so many problems, becomes a necessary element if a market and a society are to remain free.

This role of uncertainty is not widely understood, especially in the emerging markets. With the global economy going through yet another crisis, there is a danger that the emerging markets, which have just recently begun to operate as free market economies, will retrench due to bad times. They are not prepared for the uncertainty that is necessary if a free market is to function and to search for solutions to its economic

problems. Instead, they will tend to "restore order" by imposing a more rigid structure on their society. By doing so, they risk losing the very elements that make a free market so desirable. That is not to say that nothing should be done ("Let the free market decide!"). Rather, actions should be taken to set limits on what individuals can do, without dictating exactly what they should do. We will examine this seemingly contradictory statement in great detail.

This book is about the links between the Austrian school of economics and complexity theory; however, it is nonmathematical. The intent is to draw attention to the dangers of too much planning at either the individual or the government level. We will find that rules are important for creating and maintaining complexity, but the rules should be limitations, not commands. They should encourage cooperation and ensure that the environment also encourages competition.

This book is also about the nature of uncertainty, and why it is necessary for a free society. We often consider uncertainty to be undesirable because it means that things are risky. We will find that, at times, particularly when dealing with competition, risk can only be lowered when uncertainty is *increased.* The ability to adapt and evolve may be destroyed by reducing uncertainty. The emerging market governments are on the verge of doing just that; they are confusing uncertainty with risk. A large part of our discussion is tied to distinguishing between these two similar but different states.

Peter Bernstein, in his excellent book *Against the Gods: The Remarkable Story of Risk,* touched on this distinction. Understanding the true nature of uncertainty, he said, makes us "free souls" who can make decisions that are useful. As he puts it: ". . . the world of pure probability . . . has nothing to do with . . . creative human beings struggling to find their way out of the darkness." A large part of my effort in this work is to

help people understand the distinction between risk and uncertainty so that "risk reduction" does not destroy the freedom we cherish so much.

Because of the wide range of material, the book is divided into two parts. Part One largely deals with complexity theory and the nature of uncertainty. Apart from brief references, the major discussion of economics is deferred to Part Two, where we discuss the Austrian school of economics and its links to complexity theory. The book closes with a review of the implications that these observations have for the future of free markets. The tone is informal because I would like this book to be read by anyone who makes decisions under conditions of *true* uncertainty. We experience true uncertainty when we do not know the probabilities of the possible outcomes because we do not even know what all of the possible outcomes are. By understanding how truly ignorant we are, we will be able to make better decisions, even as we continue to make mistakes.

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E.E.P

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CHAPTER 1

Introduction: Life, Risk, and Uncertainty

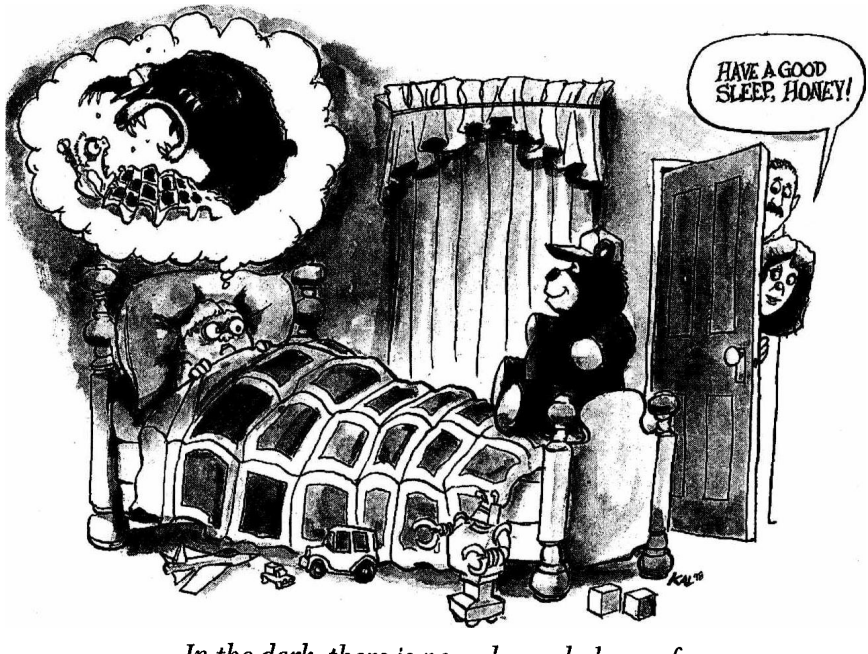
We demand rigidly defined areas of doubt and uncertainty!
—*Vroomfondel,* Hitchhiker's Guide to the Galaxy

LIFE is uncertain. We can be certain of that. Every day, we are faced with unpredictable events. Some are large. Most are small. Uncertainty makes us uneasy, nervous about the future. Uncertainty is bad. We spend time preparing for uncertainty so we are not "blindsided" or "caught off guard."

Humans have long tried to ease uncertainty by predicting the future. Early predictions were attempted through supernatural means. More recently, scientific methods have been used. Science has helped, but because some uncertainty always remains, supernatural means continue to be used, even though most of us know that they are not valid. Horoscopes, for instance, are still published in the newspapers and are widely consulted. We have a deep wish, a deep need to increase the predictability, the order of our lives. We continue to search for ways to reduce uncertainty—and the risk that we perceive accompanying it.

Yet, we know that risk taking is the only way to achieve success. The most profitable routes, both personally and professionally, are usually the risky ones. Heroes, whether they are soldiers, explorers, scientists, artists, or writers, are people who take advantage of those opportunities. By taking risks, great battles are won—in war, in the university, and in the marketplace. Risk taking advances our culture, our knowledge, and our wealth. Risk taking also breeds innovation and growth.

Here, we reach the paradox of risk and uncertainty. On the one hand, risk is something to be minimized—or even eliminated if possible. At the same time, taking a risk, or using uncertainty to our advantage, brings opportunity and advancement. Risk and uncertainty are synonymous, yet both can be good or bad. We fear risk and uncertainty, even as we know we need them.



In the dark, there is no order, only hope of order in the midst of uncertainty.

Part of the problem is a perception that uncertainty and risk are synonymous. Are they? Risk is tied to the possibility of loss, like gambling. Uncertainty, on the other hand, is merely the unknown; loss is not always involved. Yet, uncertainty makes us more uneasy than when we face a situation that has known risks. This anxiety is bred into us. If you sit in a room in your own house, in the dark, you will feel uneasy. Despite the fact that you know all of the objects in the room and where they are placed, you imagine that other things are in those objects. They become vague shapes, patterns in the dark. We need to face this anxiety and accept intellectually that there is nothing to be afraid of. The uncertainty we face in the dark has no real risk, just perceived risk, because we do not know, for sure, what's out there. We desire an order, or perfect knowledge, that comes only when we turn on the lights. In the dark, there is no order. There is only the hope of order in the midst of uncertainty. In real life, of course, we are always "sitting in the dark," trying to guess at how things would look if we could "turn on the lights." We try to impose this order, even if there is no proof that order exists. We need order even as we extol risk taking.

So, we are torn between these two needs: the need for order, and the need for uncertainty. The urge to bring order and safety usually wins out. Yet, we need uncertainty; without it, we become stagnant and unmotivated. Leninist Communism is one example of how too much order, too much control, took the life out of a system, which then lost its ability to innovate and adapt. The lack of competition reduced the ability of the communist economy to adapt to new conditions, and, as we all know, adaptability is the key to survivorship.

We are not only afraid of *being* in the dark, we are also suspicious of being *kept* in the dark. We often feel that the universe has a hidden order that we cannot quite comprehend. In ancient times, this order was attributed to the gods—omnipotent beings

who controlled humans' fates. Greek myths in particular portrayed humans as pawns in the great games played by the gods. More recently, there are suspicions of global conspiracies. These conspiracies are cited for events that are too important to be random. We no longer describe them as "acts of God," so they must be the work of other people—people who are hiding their influence over us, covering up their involvement. They are keeping the rest of us in the dark. Among the events attributed to these people are political assassinations and UFO sightings. Examining these events in minute detail results in a long list of "coincidences" which, in the minds of the conspiracy buffs, are too numerous to be truly random. There must be a central planner who is at the hub of a sinister form of order. No one admits to the conspiracy, so there must be a cover-up. Better to think that we are all being kept in the dark by sinister forces than to admit that there is no order. Yet, as we shall see, order can erupt spontaneously, without a central planner. This spontaneous order, which evolves from complexity, is often confused with conspiracy. The fact that this spontaneous order *needs* uncertainty makes the process even more counterintuitive. This spontaneous order is the basis of the "invisible hand" described by Adam Smith. A free market economy is an evolving structure with no central planner, but it does have coordinated activity by the participants.

The spontaneous nature of free markets makes them innovative and resilient, but there is a cost. The cost of freedom is uncertainty. Only by living with uncertainty can a free society thrive. For this reason, many societies slide back into totalitarian rule. They cannot accept the responsibility of living with the uncertainty that is necessary to maintain a free market. It is easier for them to rely on the certainty of a central planner than to live with the uncertainty of a free society.

In spite of our diversity, we *are* all similar. We have global characteristics that define us as humans. Yet, in detail, each of

us is unique. This global order, combined with local randomness, minimizes the chances that we will all be susceptible to the same disease. Because humanity is robust with respect to changes in its environment, continuity is maintained. Through diversity, we increase the uncertainty regarding our genetic code and gain protection against a virus's invasion. Thus, uncertainty lowers our risk from virus.

As a social system, the stock market also has the need for uncertainty. The stock market exists to give investors a venue for trading. Investors want to make as much money as possible. However, the market, as an entity, does not have this goal. The market exists to provide liquidity, plain and simple. Therefore, it is in the market's interest to make itself as complex as possible. The end result is always the rise and fall of prices and the transfer of wealth. This creates market cycles that are closely related to the business cycle. However, each market cycle has different circumstances underlying its dynamics. In one era, technology stocks are the driving force. In another, oil prices have a similar role. Each market cycle has its own story, but the end result is always the same: rising and falling prices. Once again, we have global structure and local randomness.

Why does this structure exist? To offer opportunity to all participants, while allowing no single investor to have an advantage over the others. If the market did have a predictable structure (i.e., a "perfect" trading system exists), then someone would figure it out and accumulate all of the world's wealth. The market would cease to exist; it would die. However, if the market were completely unpredictable, no one would have incentive to participate. Again, there would be no market.

Thus, we come to the paradox of capitalism and free markets: opportunity for everyone, but the advantage to no one. Each business cycle is different in detail; that is, the underlying cause of each cycle is different. No *one* investment approach will work all of the time, at least in the short term. Many approaches will