Fooled By Randomness

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A MATHEMATICAL MEDITATION ON HISTORY

On Monte Carlo simulation as a metaphor for understanding a sequence of random historical events. On randomness and artificial history. Age is beauty, almost always, and the new and the young are generally toxic. Send your history professor to an introductory class on sampling theory.

Europlayboy Mathematics

The stereotype of a pure mathematician presents an anemic man with a shaggy beard and grimy and uncut fingernails silently laboring on a Spartan but disorganized desk. With thin shoulders and a pot belly, he sits in a grubby office, totally absorbed in his work, oblivious to the grunginess of his surroundings. He grew up in a communist regime and speaks English with an astringent and throaty Eastern European accent. When he eats, crumbs of food accumulate in his beard. With time he becomes more and more absorbed in his subject matter of pure theorems, reaching levels of ever increasing abstraction. The American public was recently exposed to one of these characters with the Unabomber, the bearded and recluse mathematician who lived in a hut and took to murdering people who promoted modern technology. No journalist was capable of even coming close to describing the subject matter of his thesis, “Complex Boundaries,” as it has no intelligible equivalent—a complex number being an entirely abstract and imaginary number that includes the square root of minus one, an object that has no analog outside of the world of mathematics.

The name Monte Carlo conjures up the image of a suntanned urbane man of the Europlayboy variety entering a casino under a whiff of the Mediterranean breeze. He is an apt skier and tennis player, but also can hold his own in chess and bridge. He drives a gray sports car, dresses in a well-ironed Italian handmade suit, and speaks carefully and smoothly about mundane, but real, matters, those a journalist can easily describe to the public in compact sentences. Inside the casino he astutely counts the cards, mastering the odds, and bets in a studied manner, his mind producing precise calculations of his optimal betting size. He could be James Bond’s smarter lost brother.

Now when I think of Monte Carlo mathematics, I think of a happy combination of the two: The Monte Carlo man’s realism without the shallowness, combined with the mathematician’s intuitions without the excessive abstraction. For indeed this branch of mathematics is of immense practical use—it does not present the same dryness commonly associated with mathematics. I became addicted to it the minute I became a trader. It shaped my thinking in most matters related to randomness. Most of the examples used in this book were created with my Monte Carlo generator, which I introduce in this chapter. Yet it is far more a way of thinking than a computational method. Mathematics is principally a tool to meditate, rather than to compute.

The Tools

The notion of alternative histories discussed in the last chapter can be extended considerably and subjected to all manner of technical refinement. This brings us to the tools used in my profession to toy with uncertainty. I will outline them next. Monte Carlo methods, in brief, consist of creating artificial history using the following concepts.

First, consider the sample path. The invisible histories have a scientific name, alternative sample paths, a name borrowed from the field of mathematics of probability called stochastic processes. The notion of

path, as opposed to outcome, indicates that it is not a mere MBA-style scenario analysis, but the examination of a sequence of scenarios along the course of time. We are not just concerned with where a bird can end up tomorrow night, but rather with all the various places it can possibly visit during the time interval. We are not concerned with what the investor's worth would be in, say, a year, but rather of the heart-wrenching rides he may experience during that period. The word sample stresses that one sees only one realization among a collection of possible ones. Now, a sample path can be either deterministic or random, which brings the next distinction.

A random sample path, also called a random run, is the mathematical name for such a succession of virtual historical events, starting at a given date and ending at another, except that they are subjected to some varying level of uncertainty. However, the word random should not be mistaken for equiprobable (i.e., having the same probability). Some outcomes will give a higher probability than others. An example of a random sample path can be the body temperature of your explorer cousin during his latest bout with typhoid fever, measured hourly from the beginning to the end of his episode. It can also be a simulation of the price of your favorite technology stock, measured daily at the close of the market, over, say, one year. Starting at $100, in one scenario it can end up at $20 having seen a high of $220; in another it can end up at $145 having seen a low of $10. Another example is the evolution of your wealth during an evening at a casino. You start with $1,000 in your pocket, and measure it every fifteen minutes. In one sample path you have $2,200 at midnight; in another you barely have $20 left for a cab fare.

Stochastic processes refer to the dynamics of events unfolding with the course of time. Stochastic is a fancy Greek name for random. This branch of probability concerns itself with the study of the evolution of successive random events—one could call it the mathematics of history. The key about a process is that it has time in it.

What is a Monte Carlo generator? Imagine that you can replicate a perfect roulette wheel in your attic without having recourse to a carpenter. Computer programs can be written to simulate just about anything. They are even better (and cheaper) than the roulette wheel built by your carpenter, as this physical version may be inclined to favor one number more than others owing to a possible slant in its build or the floor of your attic. These are called the biases.

Monte Carlo simulations are closer to a toy than anything I have seen in my adult life. One can generate thousands, perhaps millions, of random sample paths, and look at the prevalent characteristics of some of their features. The assistance of the computer is instrumental in such studies. The glamorous reference to Monte Carlo indicates the metaphor of simulating the random events in the manner of a virtual casino. One sets conditions believed to resemble the ones that prevail in reality, and launches a collection of simulations around possible events. With no mathematical literacy we can launch a Monte Carlo simulation of an eighteen-year-old Christian Lebanese successively playing Russian roulette for a given sum, and see how many of these attempts result in enrichment, or how long it takes on average before he hits the obituary. We can change the barrel to contain 500 holes, a matter that would decrease the probability of death, and see the results.

Monte Carlo simulation methods were pioneered in martial physics in the Los Alamos laboratory during the A-bomb preparation. They became popular in financial mathematics in the 1980s, particularly in the theories of the random walk of asset prices. Clearly, we have to say that the example of Russian roulette does not need such apparatus, but many problems, particularly those resembling real-life situations, require the potency of a Monte Carlo simulator.

Monte Carlo Mathematics

It is a fact that "true" mathematicians do not like Monte Carlo methods. They believe that they rob us of the finesse and elegance of mathematics. They call it "brute force." For we can replace a large portion

of mathematical knowledge with a Monte Carlo simulator (and other computational tricks). For instance, someone with no formal knowledge of geometry can compute the mysterious, almost mystical Pi. How? By drawing a circle inside of a square, and "shooting" random bullets into the picture (as in an arcade), specifying equal probabilities of hitting any point on the map (something called a uniform distribution). The ratio of bullets inside the circle divided by those inside and outside the circle will deliver a multiple of the mystical Pi, with possibly infinite precision. Clearly, this is not an efficient use of a computer as Pi can be computed analytically, that is, in a mathematical form, but the method can give some users more intuition about the subject matter than lines of equations. Some people's brains and intuitions are oriented in such a way that they are more capable of getting a point in such a manner (I count myself one of those). The computer might not be natural to our human brain; neither is mathematics.

I am not a "native" mathematician, that is, I am someone who does not speak mathematics as a native language, but someone who speaks it with a trace of a foreign accent. For I am not interested in mathematical properties per se, only in the application, while a mathematician would be interested in improving mathematics (via theorems and proofs). I proved incapable of concentrating on deciphering a single equation unless I was motivated by a real problem (with a modicum of greed); thus most of what I know comes from derivatives trading—options pushed me to study the math of probability. Many compulsive gamblers, who otherwise would be of middling intelligence, acquire remarkable card-counting skills thanks to their passionate greed.

Another analogy would be with grammar; mathematics is often tedious and insightless grammar. There are those who are interested in grammar for grammar's sake, and those interested in avoiding solecisms while writing documents. Those of us in the second category are called "quants"—like physicists, we have more interest in the employment of the mathematical tool than in the tool itself. Mathematicians are born, never made. Physicists and quants too. I do not care about the "elegance" and "quality" of the mathematics I use so long as I can get the point right. I have recourse to Monte Carlo machines whenever I can. They can get the work done. They are also far more pedagogical, and I will use them in this book for the examples.

Indeed, probability is an introspective field of inquiry, as it affects more than one science, particularly the mother of all sciences: that of knowledge. It is impossible to assess the quality of the knowledge we are gathering without allowing a share of randomness in the manner it is obtained and cleaning the argument from the chance coincidence that could have seeped into its construction. In science, probability and information are treated in exactly the same manner. Literally every great thinker has dabbled with it, most of them obsessively. The two greatest minds to me, Einstein and Keynes, both started their intellectual journeys with it. Einstein wrote a major paper in 1905, in which he was almost the first to examine in probabilistic terms the succession of random events, namely the evolution of suspended particles in a stationary liquid. His article on the theory of the Brownian movement can be used as the backbone of the random walk approach used in financial modeling. As for Keynes, to the literate person he is not the political economist that tweed-clad leftists love to quote, but the author of the magisterial, introspective, and potent Treatise on Probability. For before his venturing into the murky field of political economy, Keynes was a probabilist. He also had other interesting attributes (he blew up trading his account after experiencing excessive opulence—people's understanding of probability does not translate into their behavior).

The reader can guess that the next step from such probabilistic introspection is to get drawn into philosophy, particularly the branch of philosophy that concerns itself with knowledge, called epistemology or methodology, or philosophy of science. We will not get into the topic until later in the book.

FUN IN MY ATTIC

Making History

In the early 1990s, like many of my friends in quantitative finance, I became addicted to the various Monte Carlo engines, which I taught myself to build, thrilled to feel that I was generating history, a Demiurgus. It can be electrifying to generate virtual histories and watch the dispersion between the various results. Such dispersion is indicative of the degree of resistance to randomness. This is where I am convinced that I have been extremely lucky in my choice of career: One of the attractive aspects of my profession as a quantitative option trader is that I have close to 95% of my day free to think, read, and research (or "reflect" in the gym, on ski slopes, or, more effectively, on a park bench). I also had the privilege of frequently "working" from my well-equipped attic.

The dividend of the computer revolution to us did not come in the flooding of self-perpetuating e-mail messages and access to chat rooms; it was in the sudden availability of fast processors capable of generating a million sample paths per minute. Recall that I never considered myself better than an unenthusiastic equation solver and was rarely capable of prowess in the matter—being better at setting up equations than solving them. Suddenly, my engine allowed me to solve with minimal effort the most intractable of equations. Few solutions became out of reach.

Zorglubs Crowding the Attic

My Monte Carlo engine took me on a few interesting adventures. While my colleagues were immersed in news stories, central bank announcements, earnings reports, economic forecasts, sports results, and, not least, office politics, I started toying with it in fields bordering my home base of financial probability. A natural field of expansion for the amateur is evolutionary biology—the universality of its message and its application to markets are appealing. I started simulating populations of fast-mutating animals called Zorglubs under climatic changes and witnessing the most unexpected of conclusions—some of the results are recycled in Chapter 5. My aim, as a pure amateur fleeing the boredom of business life, was merely to develop intuitions for these events—the sort of intuitions that amateurs build away from the overly detailed sophistication of the professional researcher. I also toyed with molecular biology, generating randomly occurring cancer cells and witnessing some surprising aspects of their evolution. Naturally the analog to fabricating populations of Zorglubs was to simulate a population of "idiotic bull," "impetuous bear," and "cautious" traders under different market regimes, say booms and busts, and to examine their short-term and long-term survival. Under such a structure, "idiotic bull" traders who get rich from the rally would use the proceeds to buy more assets, driving prices higher, until their ultimate shellacking. Bearish traders, though, rarely made it in the boom to get to the bust. My models showed that ultimately almost nobody really survived; bears dropped out like flies in the rally and bulls ended up being slaughtered, as paper profits vanished when the music stopped. But there was one exception; some of those who traded options (I called them option buyers) had remarkable staying power and I wanted to be one of those. How? Because they could buy the insurance against blowup; they could get anxiety-free sleep at night, thanks to the knowledge that if their careers were threatened, it would not be owing to the outcome of a single day.

If the tone of this book seems steeped in the culture of Darwinism and evolutionary thinking, it does not come from any remotely formal training in the natural sciences, but from the evolutionary way of thinking taught by my Monte Carlo simulators.

I reckon that I outgrew the desire to generate random runs every time I want to explore an idea—but by dint of playing with a Monte Carlo engine for years I can no longer visualize a realized outcome without reference to the nonrealized ones. I call that "summing under histories," borrowing the expression from the colorful physicist Richard Feynman who applied such methods to examine the dynamics of subatomic particles.

Using my Monte Carlo to make and remake history reminded me of the experimental novels (the so-called new novels) by such writers as Alain Robbe-Grillet, popular in the 1960s and 1970s. There

the same chapter would be written and revised, the writer each time changing the plot like a new sample path. Somehow the author was freed from the past situation he helped create and allowed himself the indulgence to change the plot retroactively.

Denigration of History

One more word on history seen from a Monte Carlo perspective. The wisdom of such classical stories as Solon's prods me to spend even more time in the company of the classical historians, even if the stories, like Solon's warning, have benefited from the patina of time. However, this goes against the grain: Learning from history does not come naturally to us humans, a fact that is so visible in the endless repetitions of identically configured booms and busts in modern markets. By history I refer to the anecdotes, not the historical theorizing, the grand-scale historicism that aims to interpret events with theories based on uncovering some laws in the evolution of history—the sort of Hegelianism and pseudoscientific historicism leading to such calls as the end of history (it is pseudoscientific because it draws theories from past events without allowing for the fact that such combinations of events might have arisen from randomness; there is no way to verify the claims in a controlled experiment). For me, history is of use merely at the level of my desired sensibility, affecting the way I would wish to think by reference to past events, by being able to better steal the ideas of others and leverage them, correct the mental defect that seems to block my ability to learn from others. It is the respect of the elders that I would like to develop, reinforcing the awe I instinctively feel for people with gray hair, but that has eroded in my life as a trader where age and success are somewhat divorced. Indeed, I have two ways of learning from history: from the past, by reading the elders; and from the future, thanks to my Monte Carlo toy.

The Stove Is Hot

As I mentioned above, it is not natural for us to learn from history. We have enough clues to believe that our human endowment does not favor transfers of experience in a cultural way but through selection of those who bear some favorable traits. It is a platitude that children learn only from their own mistakes; they will cease to touch a burning stove only when they are themselves burned; no possible warning by others can lead to developing the smallest form of cautiousness. Adults, too, suffer from such a condition. This point has been examined by behavioral economics pioneers Daniel Kahneman and Amos Tversky with regard to the choices people make in selecting risky medical treatments—I myself have seen it in my being extremely lax in the area of detection and prevention (i.e., I refuse to derive my risks from the probabilities computed on others, feeling that I am somewhat special) yet extremely aggressive in the treatment of medical conditions (I overreact when I am burned), which is not coherent with rational behavior under uncertainty. This congenital denigration of the experience of others is not limited to children or to people like myself; it affects business decision makers and investors on a grand scale.

If you think that merely reading history books would help you learn "from other's mistakes," consider the following nineteenth-century experiment. In a well-known psychology case the Swiss doctor Claparède had an amnesic patient completely crippled with her ailment. Her condition was so bad that he would have to reintroduce himself to her at a frequency of once per fifteen minutes for her to remember who he was. One day he secreted a pin in his hand before shaking hers. The next day she quickly withdrew her hand as he tried to greet her, but still did not recognize him. Since then plenty of discussions of amnesic patients show some form of learning on the part of people without their being aware of it and without it being stored in conscious memory. The scientific name of the distinction between the two memories, the conscious and the nonconscious, is declarative and nondeclarative. Much of the risk avoidance that comes from experiences is part of the second. The only way I developed a respect for history is by making myself aware of the fact that I was not programmed to learn from it in a textbook format.

Actually, things can be worse than that: In some respects we do not learn from our own history. Several branches of research have been examining our inability to learn from our own reactions to past events: For example, people fail to learn that their emotional reactions to past experiences (positive or negative) were short-lived—yet they continuously retain the bias of thinking that the purchase of an object will bring long-lasting, possibly permanent, happiness or that a setback will cause severe and prolonged distress (when in the past similar setbacks did not affect them for very long and the joy of the purchase was short-lived).

All of my colleagues who I have known to denigrate history blew up spectacularly—and I have yet to encounter some such person who has not blown up. But the truly interesting point lies in the remarkable similarities in their approaches. The blowup, I will repeat, is different from merely incurring a monetary loss; it is losing money when one does not believe that such fact is possible at all. There is nothing wrong with a risk taker taking a hit provided one declares that one is a risk taker rather than that the risk being taken is small or nonexistent. Characteristically, blown-up traders think that they knew enough about the world to reject the possibility of the adverse event taking place: There was no courage in their taking such risks, just ignorance. I have noticed plenty of analogies between those who blew up in the stock market crash of 1987, those who blew up in the Japan meltdown of 1990, those who blew up in the bond market débâcle of 1994, those who blew up in Russia in 1998, and those who blew up shorting Nasdaq stocks. They all made claims to the effect that “these times are different” or that “their market was different,” and offered seemingly well-constructed, intellectual arguments (of an economic nature) to justify their claims; they were unable to accept that the experience of others was out there, in the open, freely available to all, with books detailing crashes in every bookstore. Aside from these generalized systemic blowups, I have seen hundreds of option traders forced to leave the business after blowing up in a stupid manner, in spite of warnings by the veterans, similar to a child’s touching the stove. This I find to resemble my own personal attitude with respect to the detection and prevention of the variety of ailments I may be subjected to. Every man believes himself to be quite different, a matter that amplifies the “why me?” shock upon a diagnosis.

Skills in Predicting Past History

We can discuss this point from different angles. Experts call one manifestation of such denigration of history historical determinism. In a nutshell we think that we would know when history is made; we believe that people who, say, witnessed the stock market crash of 1929 knew then that they lived an acute historical event and that, should these events repeat themselves, they too would know about such facts. Life for us is made to resemble an adventure movie, as we know ahead of time that something big is about to happen. It is hard to imagine that people who witnessed history did not know at the time how important the moment was. Somehow all respect we may have for history does not translate well into our treatment of the present.

Jean-Patrice of the last chapter was abruptly replaced by an interesting civil servant type who had never been involved in the randomness professions. He just went to the right civil servant schools where people learn to write reports and had some senior managerial position in the institution. As is typical with subjectively assessed positions he tried to make his predecessor look bad: Jean-Patrice was deemed sloppy and unprofessional. The civil servant’s first undertaking was to run a formal analysis of our transactions; he found that we traded a little too much, incurring very large back office expenditure. He analyzed a large segment of foreign exchange traders’ transactions, then wrote a report explaining that only close to 1% of these transactions generated significant profits; the rest generated either losses or small profits. He was shocked that the traders did not do more of the winners and less of the losers. It was obvious to him that we needed to comply with these instructions immediately. If we just doubled the winners, the results for the institution would be so great. How come you highly paid traders did not think about it before?

Things are always obvious after the fact. The civil servant was a very intelligent person, and this mistake is much more prevalent than one would think. It has to do with the way our mind handles historical information. When you look at the past, the past will always be deterministic, since only one single observation took place. Our mind will interpret most events not with the preceding ones in mind, but the following ones. Imagine taking a test knowing the answer. While we know that history flows forward, it is difficult to realize that we envision it backward. Why is it so? We will discuss the point in Chapter 11 but here is a possible explanation: Our minds are not quite designed to understand how the world works, but, rather, to get out of trouble rapidly and have progeny. If they were made for us to understand things, then we would have a machine in it that would run the past history as in a VCR, with a correct chronology, and it would slow us down so much that we would have trouble operating. Psychologists call this overestimation of what one knew at the time of the event due to subsequent information the hindsight bias, the “I knew it all along” effect.

Now the civil servant called the trades that ended up as losers “gross mistakes,” just like journalists call decisions that end up costing a candidate his election a “mistake.” I will repeat this point until I get hoarse: A mistake is not something to be determined after the fact, but in the light of the information until that point.

A more vicious effect of such hindsight bias is that those who are very good at predicting the past will think of themselves as good at predicting the future, and feel confident about their ability to do so. This is why events like those of September 11, 2001, never teach us that we live in a world where important events are not predictable—even the Twin Towers’ collapse appears to have been predictable then.

My Solon

I have another reason to be obsessed with Solon’s warning. I hark back to the very same strip of land in the Eastern Mediterranean where the story took place. My ancestors experienced bouts of extreme opulence and embarrassing penury over the course of a single generation, with abrupt regressions that people around me who have the memory of steady and linear betterment do not think feasible (at least not at the time of writing). Those around me either have (so far) had few family setbacks (except for the Great Depression) or, more generally, are not suffused with enough sense of history to reflect backward. For people of my background, Eastern Mediterranean Greek Orthodox and invaded Eastern Roman citizens, it was as if our soul had been wired with the remembrance of that sad spring day circa 500 years ago when Constantinople, under the invading Turks, fell out of history, leaving us the lost subjects of a dead empire, very prosperous minorities in an Islamic world—but with an extremely fragile wealth. Moreover, I vividly remember the image of my own dignified grandfather, a former deputy prime minister and son of a deputy prime minister (whom I never saw without a suit), residing in a nondescript apartment in Athens, his estate having been blown up during the Lebanese civil war. Incidentally, having experienced the ravages of war, I find undignified impoverishment far harsher than physical danger (somehow dying in full dignity appears to me far preferable to living a janitorial life, which is one of the reasons I dislike financial risks far more than physical ones). I am certain that Croesus worried more about the loss of his Kingdom than the perils to his life.

There is an important and nontrivial aspect of historical thinking, perhaps more applicable to the markets than anything else: Unlike many “hard” sciences, history cannot lend itself to experimentation. But somehow, overall, history is potent enough to deliver, on time, in the medium to long run, most of the possible scenarios, and to eventually bury the bad guy. Bad trades catch up with you, it is frequently said in the markets. Mathematicians of probability give that a fancy name: ergodicity. It means, roughly, that (under certain conditions) very long sample paths would end up resembling each other. The properties of a very, very long sample path would be similar to the Monte Carlo properties of an average of shorter ones. The janitor in Chapter 1 who won the lottery, if he lived one thousand years, cannot be expected to win more lotteries. Those who were unlucky in life in spite of their skills would eventually rise. The lucky fool might have benefited from some luck in life; over the longer run he

would slowly converge to the state of a less-lucky idiot. Each one would revert to his long-term properties.

DISTILLED THINKING ON YOUR PALMPILOT

Breaking News

The journalist, my bête noire, entered this book with George Will dealing with random outcomes. In the next step I will show how my Monte Carlo toy taught me to favor distilled thinking, by which I mean the thinking based on information around us that is stripped of meaningless but diverting clutter. For the difference between noise and information, the topic of this book (noise has more randomness) has an analog: that between journalism and history. To be competent, a journalist should view matters like a historian, and play down the value of the information he is providing, such as by saying: “Today the market went up, but this information is not too relevant as it emanates mostly from noise.” He would certainly lose his job by trivializing the value of the information in his hands. Not only is it difficult for the journalist to think more like a historian, but it is, alas, the historian who is becoming more like the journalist.

For an idea, age is beauty (it is premature to discuss the mathematics of the point).The applicability of Solon’s warning to a life in randomness, in contrast with the exact opposite message delivered by the prevailing media-soaked culture, reinforces my instinct to value distilled thought over newer thinking, regardless of its apparent sophistication—another reason to accumulate the hoary volumes by my bedside (I confess that the only news items I currently read are the far more interesting upscale social gossip stories found in Tatler, Paris Match, and Vanity Fair—in addition to The Economist). Aside from the decorum of ancient thought as opposed to the coarseness of fresh ink, I have spent some time phrasing the idea in the mathematics of evolutionary arguments and conditional probability. For an idea to have survived so long across so many cycles is indicative of its relative fitness. Noise, at least some noise, was filtered out. Mathematically, progress means that some new information is better than past information, not that the average of new information will supplant past information, which means that it is optimal for someone, when in doubt, to systematically reject the new idea, information, or method. Clearly and shockingly, always. Why?

The argument in favor of “new things” and even more “new new things” goes as follows: Look at the dramatic changes that have been brought about by the arrival of new technologies, such as the automobile, the airplane, the telephone, and the personal computer. Middlebrow inference (inference stripped of probabilistic thinking) would lead one to believe that all new technologies and inventions would likewise revolutionize our lives. But the answer is not so obvious: Here we only see and count the winners, to the exclusion of the losers (it is like saying that actors and writers are rich, ignoring the fact that actors are largely waiters—and lucky to be ones, for the less comely writers usually serve French fries at McDonald’s). Losers? The Saturday newspaper lists dozens of new patents of such items that can revolutionize our lives. People tend to infer that because some inventions have revolutionized our lives that inventions are good to endorse and we should favor the new over the old. I hold the opposite view. The opportunity cost of missing a “new new thing” like the airplane and the automobile is minuscule compared to the toxicity of all the garbage one has to go through to get to these jewels (assuming these have brought some improvement to our lives, which I frequently doubt).

Now the exact same argument applies to information. The problem with information is not that it is diverting and generally useless, but that it is toxic. We will examine the dubious value of the highly frequent news with a more technical discussion of signal filtering and observation frequency farther down. I will say here that such respect for the time-honored provides arguments to rule out any commerce with the babbling modern journalist and implies a minimal exposure to the media as a guiding principle for someone involved in decision making under uncertainty. If there is anything better than noise in the mass of “urgent” news pounding us, it would be like a needle in a haystack. People do

not realize that the media is paid to get your attention. For a journalist, silence rarely surpasses any word.

On the rare occasions when I boarded the 6:42 train to New York I observed with amazement the hordes of depressed business commuters (who seemed to prefer to be elsewhere) studiously buried in The Wall Street Journal, apprised of the minutiae of companies that, at the time of writing now, are probably out of business. Indeed it is difficult to ascertain whether they seem depressed because they are reading the newspaper, or if depressive people tend to read the newspaper, or if people who are living outside their genetic habitat both read the newspaper and look sleepy and depressed. But while early on in my career such focus on noise would have offended me intellectually, as I would have deemed such information as too statistically insignificant for the derivation of any meaningful conclusion, I currently look at it with delight. I am happy to see such mass-scale idiotic decision making, prone to overreaction in their postperusal investment orders—in other words I currently see in the fact that people read such material an insurance for my continuing in the entertaining business of option trading against the fools of randomness. (It takes a huge investment in introspection to learn that the thirty or more hours spent "studying" the news last month neither had any predictive ability during your activities of that month nor did it impact your current knowledge of the world. This problem is similar to the weaknesses in our ability to correct for past errors: Like a health club membership taken out to satisfy a New Year's resolution, people often think that it will surely be the next batch of news that will really make a difference to their understanding of things.)

Shiller Redux

Much of the thinking about the negative value of information on society in general was sparked by Robert Shiller. Not just in financial markets; but overall his 1981 paper may be the first mathematically formulated introspection on the manner in which society in general handles information. Shiller made his mark with his 1981 paper on the volatility of markets, where he determined that if a stock price is the estimated value of "something" (say the discounted cash flows from a corporation), then market prices are way too volatile in relation to tangible manifestations of that "something" (he used dividends as proxy). Prices swing more than the fundamentals they are supposed to reflect, they visibly overreact by being too high at times (when their price overshoots the good news or when they go up without any marked reason) or too low at others. The volatility differential between prices and information meant that something about "rational expectation" did not work. (Prices did not rationally reflect the long-term value of securities and were overshooting in either direction.) Markets had to be wrong. Shiller then pronounced markets to be not as efficient as established by financial theory (efficient markets meant, in a nutshell, that prices should adapt to all available information in such a way as to be totally unpredictable to us humans and prevent people from deriving profits). This conclusion set off calls by the religious orders of high finance for the destruction of the infidel who committed such apostasy. Interestingly, and by some strange coincidence, it is that very same Shiller who was trounced by George Will only one chapter ago.

The principal criticism against Shiller came from Robert C. Merton. The attacks were purely on methodological grounds (Shiller's analysis was extremely rough; for instance, his using dividends in place of earnings was rather weak). Merton was also defending the official financial theory position that markets needed to be efficient and could not possibly deliver opportunities on a silver plate. Yet the same Robert C. Merton later introduced himself as the "founding partner" of a hedge fund that aimed at taking advantage of market inefficiencies. Setting aside the fact that Merton's hedge fund blew up rather spectacularly from the black swan problem (with characteristic denial), his "founding" such a hedge fund requires, by implication, that he agrees with Shiller about the inefficiency of the market. The defender of the dogmas of modern finance and efficient markets started a fund that took advantage of market inefficiencies! It is as if the Pope converted to Islam.

Things are not getting any better these days. At the time of writing, news providers are offering all manner of updates, “breaking news” that can be delivered electronically in a wireless manner. The ratio of undistilled information to distilled is rising, saturating markets. The elder’s messages need not be delivered to you as imminent news.

This does not mean that all journalists are fooled by randomness noise providers: There are hordes of thoughtful journalists in the business (I would suggest London’s Anatole Kaletsky and New York’s Jim Grant and Alan Abelson as the underrated representatives of such a class among financial journalists; Gary Stix among scientific journalists); it is just that prominent media journalism is a thoughtless process of providing the noise that can capture people’s attention and there exists no mechanism for separating the two. As a matter of fact, smart journalists are often penalized. Like the lawyer in Chapter 11 who does not care about the truth, but about arguments that can sway a jury whose intellectual defects he knows intimately, journalism goes to what can capture our attention, with adequate sound bites. Again, my scholarly friends would wonder why I am getting emotional stating the obvious things about the journalists; the problem with my profession is that we depend on them for what information we need to obtain.

Gerontocracy

A preference for distilled thinking implies favoring old investors and traders, that is, investors who have been exposed to markets the longest, a matter that is counter to the common Wall Street practice of preferring those that have been the most profitable, and preferring the youngest whenever possible. I toyed with Monte Carlo simulations of heterogeneous populations of traders under a variety of regimes (closely resembling historical ones), and found a significant advantage in selecting aged traders, using as a selection criterion their cumulative years of experience rather than their absolute success (conditional on their having survived without blowing up). “Survival of the fittest,” a term so hackneyed in the investment media, does not seem to be properly understood: Under regime switching, as we will see in Chapter 5, it will be unclear who is actually the fittest, and those who will survive are not necessarily those who appear to be the fittest. Curiously, it will be the oldest, simply because older people have been exposed longer to the rare event and can be, convincingly, more resistant to it. I was amused to discover a similar evolutionary argument in mate selection that considers that women prefer (on balance) to mate with healthy older men over healthy younger ones, everything else being equal, as the former provide some evidence of better genes. Gray hair signals an enhanced ability to survive—conditional on having reached the gray hair stage, a man is likely to be more resistant to the vagaries of life. Curiously, life insurers in renaissance Italy reached the same conclusion, by charging the same insurance for a man in his twenties as they did for a man in his fifties, a sign that they had the same life expectancy; once a man crossed the forty-year mark, he had shown that very few ailments could harm him. We now proceed to a mathematical rephrasing of these arguments.

PHILOSTRATUS IN MONTE CARLO:

ON THE DIFFERENCE BETWEEN NOISE

AND INFORMATION

The wise man listens to meaning; the fool only gets the noise. The modern Greek poet C. P. Cavafy wrote a piece in 1915 after Philostratus’ adage “For the gods perceive things in the future, ordinary people things in the present, but the wise perceive things about to happen.” Cavafy wrote:

In their intense meditation the hidden sound of things approaching reaches them and they listen reverently while in the street outside the people hear nothing at all.

I thought hard and long on how to explain with as little mathematics as possible the difference between noise and meaning, and how to show why the time scale is important in judging a historical event. The Monte Carlo simulator can provide us with such an intuition. We will start with an example borrowed from the investment world, as it can be explained rather easily, but the concept can be used in any application.

Let us manufacture a happily retired dentist, living in a pleasant, sunny town. We know a priori that he is an excellent investor, and that he will be expected to earn a return of 15% in excess of Treasury bills, with a 10% error rate per annum (what we call volatility). It means that out of 100 sample paths, we expect close to 68 of them to fall within a band of plus and minus 10% around the 15% excess return, i.e., between 5% and 25% (to be technical; the bell-shaped normal distribution has 68% of all observations falling between -1 and 1 standard deviations). It also means that 95 sample paths would fall between -5% and 35%.

Clearly, we are dealing with a very optimistic situation. The dentist builds for himself a nice trading desk in his attic, aiming to spend every business day there watching the market, while sipping decaffeinated cappuccino. He has an adventurous temperament, so he finds this activity more attractive than drilling the teeth of reluctant little old Park Avenue ladies.

He subscribes to a Web-based service that supplies him with continuous prices, now to be obtained for a fraction of what he pays for his coffee. He puts his inventory of securities in his spreadsheet and can thus instantaneously monitor the value of his speculative portfolio. We are living in the era of connectivity.

A 15% return with a 10% volatility (or uncertainty) per annum translates into a 93% probability of success in any given year. But seen at a narrow time scale, this translates into a mere 50.02% probability of success over any given second as shown in Table 3.1. Over the very narrow time increment, the observation will reveal close to nothing. Yet the dentist's heart will not tell him that. Being emotional, he feels a pang with every loss, as it shows in red on his screen. He feels some pleasure when the performance is positive, but not in equivalent amount as the pain experienced when the performance is negative.

Table 3.1 Probability of success at different scales

Scale	Probability
year	93%
quarter	77%
month	67%
day	54%
hour	51.3%
minute	50.17%
second	50.02%

At the end of every day the dentist will be emotionally drained. A minute-by-minute examination of his performance means that each day (assuming eight hours per day) he will have 241 pleasurable minutes against 239 unpleasurable ones. These amount to 60,688 and 60,271, respectively, per year. Now realize that if the unpleasurable minute is worse in reverse pleasure than the pleasurable minute is in pleasure terms, then the dentist incurs a large deficit when examining his performance at a high frequency.

Consider the situation where the dentist examines his portfolio only upon receiving the monthly account from the brokerage house. As 67% of his months will be positive, he incurs only four pangs of pain per annum and eight uplifting experiences. This is the same dentist following the same strategy. Now consider the dentist looking at his performance only every year. Over the next 20 years that he is expected to live, he will experience 19 pleasant surprises for every unpleasant one!

This scaling property of randomness is generally misundderstood, even by professionals. I have seen Ph.D.s argue over a performance observed in a narrow time scale (meaningless by any standard). Before additional dumping on the journalist, more observations seem in order.

Viewing it from another angle, if we take the ratio of noise to what we call nonnoise (i.e., left column/right column), which we have the privilege here of examining quantitatively, then we have the following. Over one year we observe roughly 0.7 parts noise for every one part performance. Over one month, we observe roughly 2.32 parts noise for every one part performance. Over one hour, 30 parts noise for every one part performance, and over one second, 1,796 parts noise for every one part performance.

A few conclusions:

1. Over a short time increment, one observes the variability of the portfolio, not the returns. In other words, one sees the variance, little else. I always remind myself that what one observes is at best a combination of variance and returns, not just returns (but my emotions do not care about what I tell myself).

2. Our emotions are not designed to understand the point. The dentist did better when he dealt with monthly statements rather than more frequent ones. Perhaps it would be even better for him if he limited himself to yearly statements. (If you think that you can control your emotions, think that some people also believe that they can control their heartbeat or hair growth.)

3. When I see an investor monitoring his portfolio with live prices on his cellular telephone or his handheld, I smile and smile.

Finally, I reckon that I am not immune to such an emotional defect. But I deal with it by having no access to information, except in rare circumstances. Again, I prefer to read poetry. If an event is important enough, it will find its way to my ears. I will return to this point in time.

The same methodology can explain why the news (the high scale) is full of noise and why history (the low scale) is largely stripped of it (though fraught with interpretation problems). This explains why I prefer not to read the newspaper (outside of the obituary), why I never chitchat about markets, and, when in a trading room, I frequent the mathematicians and the secretaries, not the traders. It explains why it is better to read The New Yorker on Mondays than The Wall Street Journal every morning (from the standpoint of frequency, aside from the massive gap in intellectual class between the two publications).

Finally, this explains why people who look too closely at randomness burn out, their emotions drained by the series of pangs they experience. Regardless of what people claim, a negative pang is not offset by a positive one (some psychologists estimate the negative effect for an average loss to be up to 2.5 the magnitude of a positive one); it will lead to an emotional deficit.

Now that you know that the high-frequency dentist has more exposure to both stress and positive pangs, and that these do not cancel out, consider that people in lab coats have examined some scary properties of this type of negative pangs on the neural system (the usual expected effect: high blood pressure; the less expected: chronic stress leads to memory loss, lessening of brain plasticity, and brain damage). To my knowledge there are no studies investigating the exact properties of trader's burnout, but a daily exposure to such high degrees of randomness without much control will have physiological effects on humans (nobody studied the effect of such exposure on the risk of cancer). What economists did not understand for a long time about positive and negative kicks is that both their biology and their intensity are different. Consider that they are mediated in different parts of the brain—and that the degree of rationality in decisions made subsequent to a gain is extremely different

from the one after a loss.

Note also that the implication that wealth does not count so much into one's well-being as the route one uses to get to it.

Some so-called wise and rational persons often blame me for "ignoring" possible valuable information in the daily newspaper and refusing to discount the details of the noise as "short-term events." Some of my employers have blamed me for living on a different planet.

My problem is that I am not rational and I am extremely prone to drown in randomness and to incur emotional torture. I am aware of my need to ruminate on park benches and in cafés away from information, but I can only do so if I am somewhat deprived of it. My sole advantage in life is that I know some of my weaknesses, mostly that I am incapable of taming my emotions facing news and incapable of seeing a performance with a clear head. Silence is far better. More on that in Part III.