CHAPTER 1

Sensory Finance

Wandering around inside the average investor's mind is very much like taking a tourist bus around Wonderland with the White Rabbit as a guide. Much that we think is obviously true turns out to be false and much self-evident nonsense is rather closer to reality than we could ever have thought.

We're going to start our tour in a place where everyone can "definitely" tell the difference between truth and falsehood, by looking at the way our senses interact with the world around us. Our ability to interact with the world and to learn from it allows us to extrapolate into the future, to make predictions and then to act on those predictions.

Unfortunately, the skills that serve us so well in everyday life combine to betray us in the topsy-turvy world of investing and finance. Our sensory system may keep us alive, but that's no guarantee it's going to make us rich.

BEATING THE BIAS BLIND SPOT

Although it's quite easy to convince people that we're biased in the way we perceive the world, it's very hard to persuade individuals that they are personally just as biased as everyone else. This is pretty irrational—how likely is it that you're the only unbiased person around? Yet there's an underlying reason for this belief and it says that we think we're better judges of the world around us than everyone else. Unfortunately, we're wrong and you are just as biased as me, and I'm just as biased as everyone else. Or I would be, if I hadn't spent a lot of time figuring out how to reduce my biases.

To demonstrate this we can start with a simple visual illusion, such as the one in Figure 1.1, where the two parallel lines are actually the same length, but don't look it. Don't take my word for it; get out a ruler and measure the lines. Remember: don't trust anyone until they've proven they deserve your trust. This trick is known as the Müller-Lyer illusion, and the unsubtle point I'm trying to make is that you can't entirely trust what your

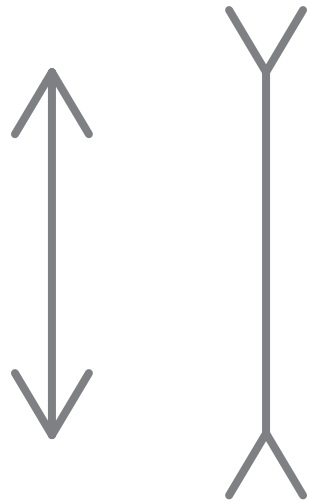

FIGURE 1.1 The Müller-Lyer Illusion

brain is telling you about what you see, which then leads to the idea that you can't always trust it about what you think. What the research shows is that it's virtually impossible to make people behave less irrationally until they can be made to accept this. The good news is that once the message gets home there are a lot of things we can do to improve matters. The less good news is that this is hard to achieve; people don't like to think they're biased, even if they're perfectly happy to believe everyone else is.

In fact, the Müller-Lyer illusion has a bit more to tell us about why we're not very good at financial decision making than it first appears. Many of the behavioral biases we meet arise for very good reasons. They're adaptations of our brain's limited processing power, designed to meet the needs of our ancestors, who were generally more concerned about not being flattened by woolly mammoths or mauled by saber-toothed tigers than they were about being fooled by financial advisers. These days, unfortunately, the predators are far harder to spot, although usually they're less hairy and toothy.

Currently, the best theory about why the Müller-Lyer illusion occurs is that it's accidentally triggering our brain's 3D mapping processes, which are tuned to "see" perspective, so we automatically "adjust" the lengths to suit this hypothesis: as Figure 1.2 shows, a real-world interpretation of the illusion suggests we're looking at the corners of a room or a box. In the real world, looking at a 3D scene like this is a far, far more common experience than someone randomly wandering up to us and showing us pictures of lines with arrowheads stuck on the end of them. For this reason, we need to be quite careful about the conclusions we draw from research in this field,

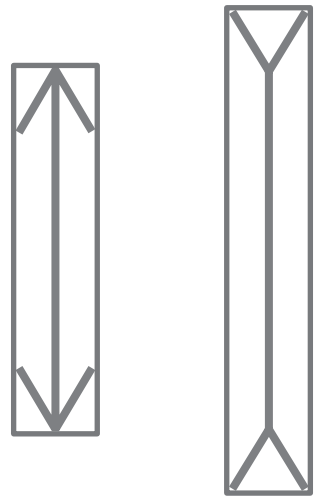

FIGURE 1.2 The Müller-Lyer Illusion as a 3D Perception

because what happens in the laboratory sometimes doesn't match up with what happens in real life.

As the Müller-Lyer illusion suggests, you can't even trust what your eyes are telling you because what we see is actually in the brain, not out there in the world, and therefore subject to whatever kinds of interpretation the brain decides to make. In fact, your eyes can't even see everything in front of you. Look at the picture in Figure 1.3, close your right eye, and focus on the + sign, holding the book about 20 inches away from your face. Now move your head towards the book, continuing to focus on the + sign. At some point the dot will vanish.

This is the point at which the image of the dot is falling on the blind spot in your left eye, where the optic nerve enters the back of the eye. Notice that your brain doesn't insert a gap where the dot should be, there's just a continuous blank field—this is your brain automatically filling in the gap as best it can. But what you're seeing is not what is actually there, and we're all affected by this, all the time. What we "see" is constructed inside the brain, based on the evidence of our eyes—but seeing is not the same as believing.

People have a similar problem when it comes to the mental filling in that accompanies behavioral biases: what the psychologists Emily Pronin and Matthew Kugler have dubbed a *bias blind spot*.[1] You'll happily agree that other people are subject to all sorts of biases, but you'll then argue that

FIGURE 1.3 + Sign

you yourself are a better judge of what biases you are affected by—which generally means that you think you can overcome your brain's willingness to fill in the gaps in your knowledge by making wild guesses and hopeful inferences, while simultaneously believing that no one else can.

Well, I'm sorry, but you're not *that* special. None of us are. Just as we all have a visual blind spot in each eye, which we don't normally notice, and we're all caught by the Müller-Lyer illusion, we're all trapped by the behavioral instincts that guided our forebears so well. The trick is to accept this, and move on—but, believe me, that's harder said than done. This chapter, and the ones that follow it, are about trying to convince you, against all your instincts, that you can't trust your brain, particularly when it comes to financial matters. Our brains have serious money issues, which impoverish us unnecessarily.

LESSON 1

Don't think that you are immune to the behavioral biases in this book: that's an outcome of the *bias blind spot*. Everyone thinks that they can overcome this by introspection, but no one actually can, anymore than you can overcome your eyes' blind spot or the Müller-Lyer illusion.

ILLUSORY PATTERN RECOGNITION

We use simple processes to navigate our way through life. We look at what happens around us and extrapolate to the future—so most of the time cars drive on the right and people in hospitals wearing white coats are doctors. Unfortunately, this process of relying on personal observation doesn't always work: in Britain the cars drive on the left and doctors in hospitals don't wear white coats—what works at home is often a local rule, not a general one, and this is especially true in stock markets. Get this wrong and you'll get knocked down by a car coming the "wrong" way and struggle to find anyone to treat your injuries.

In particular, we can generate illusory patterns using personal investing experiences, which can cause us to make really stupid decisions because we start imagining we can see trends where none really exist. Visual illusions are a type of illusory pattern, so they're an easy way of showing us we can't entirely trust our instincts and they give us some clues about how our brains interpret information about the world. In Western cultures, one of the most

common illusions is the Man in the Moon effect: the perception of a human face peering at us across the void of space. This is an example of a bias called pareidolia, the ability to see order in randomness. Pareidolia gives rise to all sorts of peculiar behaviors, many of which seem to involve images of religious figures appearing in bakery products.

All of this is vaguely amusing, but masks a serious issue. In general, we try to fit the facts to our own preconceptions, rather than theorizing on the basis of the data. We'll see patterns where none really exist, we'll extrapolate on the basis of these illusory patterns, and we'll then wonder why we've lost a ton of money. People who see images of Mother Teresa in a cinnamon bun are using their imagination and memories to "see" the picture. Someone who had no idea who Mother Teresa was would just slather on some butter and eat it.

Illusory pattern recognition is a dangerous behavioral trait where investing is concerned, because much of what investors do is exactly that: we look for patterns. You'll frequently find people commenting on how similar current market conditions are to those from some past period, or see them pouring over charts of various kinds, trying to use them to predict what's going to happen next. This is nearly all based on a perceptual fallacy because the future of investment markets isn't written in the past in ways that can be easily extracted from the data through any kind of simple pattern analysis.

Mostly, though, we don't even bother trying to analyze anything, because we didn't evolve in an environment where we had the benefit of reams of statistics and we had to operate on the basis of what researchers call "observed frequencies": essentially we looked at what was going on around us and extrapolated from that data. So, if we were unlucky enough to have a family member stomped on by an irate woolly mammoth then we'd conclude that hairy pachyderms were dangerous, and resolve to avoid them whenever possible, and we'd tell everyone we knew to do so too. In our local neighborhood, avoiding the local mad mammoth would probably have been a good decision, but it might have been that we were simply unlucky enough to live in an area populated by particularly bad tempered mammoths and a hundred miles down the coast we'd be more in danger from big cats with big teeth. In general, more people might have died in the jaws of tigers than at the feet of mammoths, but that wouldn't have changed our own local view of the world and we'd take special care to avoid mammoths because that was the data—the experience—that we had available to us.

For investors, what's especially interesting about this is that it appears that there's a link between illusory pattern recognition, lack of self-control, and poor investment returns. Some remarkable research published in *Science*, by management research experts Jennifer Whitson and Adam Galinsky,[2] showed that people made to feel like they were out of control were

more likely to see nonexistent objects in fuzzy displays, to create conspiracy theories, and to think superstitious behavior was able to change future events. In particular, they demonstrated similar behavior among expert investors in stock markets, showing the creation of illusory patterns in uncertain, volatile, and unpredictable conditions. This suggests that these conditions will cause us to generate random connections between events which, to all intents and purposes, look like superstitions, the key to which is that they allow us to try and exert control over the uncontrollable: they turn the unpredictable markets we can't control into patterns that we think we can use to predict the future.

Only we can't: we can't control or predict anything that happens in the stock market, and thinking we can is a dangerous misstep. Our personal experiences are not a reliable guide to future investment decisions and thinking that they are will lead to losses. What's worse is that the very times we most need to keep our wits about us—when the markets are in the middle of one of their periodic manic-depressive phases—are the same as when we're most likely to feel out of control, to imagine illusory patterns, and make really bad decisions.

LESSON 2

Don't extrapolate from personal experiences to general stock market trends: this will lead to *pareidolia* or *illusory pattern recognition* based on *observed frequencies*. Making investment decisions based on these intuitions will lose you money more often than not.

SUPERSTITIOUS PIGEONS—AND INVESTORS

It's no surprise that those investors who detected illusory patterns developed behaviors that look a lot like superstitions, because people are surprisingly inclined to develop irrational habits to bring them luck. Most of the time this doesn't really matter, but when these superstitions start overriding sensible investment decisions they can lead us into serious money-losing territory. It's very easy to develop investment superstitions because these can be triggered by a simple trick known as reinforcement. Unfortunately, investment markets are full of opportunities for reinforcement and if people don't continually monitor themselves they'll almost certainly fall victim to such problems.

Reinforcement is the same mechanism that Pavlov used to train his famous dogs to salivate at the sound of a bell and, in another famous example, the psychologist B. F. Skinner did something similar with pigeons. He developed an experiment in which he placed hungry pigeons in cages and then delivered food to them at irregular, random intervals. The birds developed responses that, to all intents and purposes, appeared to be superstitions linked to whatever actions they happened to be performing at the time that food was first served: head bobbing, turning repeatedly in the same direction, and so on.[3] This is another form of illusory pattern recognition, connected to a very basic instinct to get some control over their environments, even in situations where it's not possible.

Skinner went on to show that intermittent reinforcement—sometimes providing food in response to a superstitious action and sometimes not—actually *increased* the persistence of the behavior. The fact that the miracle movements quite often didn't work didn't have the effect of making the birds wonder whether they'd come up with a false hypothesis but simply made them try harder. Pigeons whose superstitions were intermittently reinforced with food proved immensely resistant to giving up their pet theories about how to get fed—one repeated its hopping behavior over 10,000 times after reinforcement had stopped.

Of course, we're not pigeon-brained, but there's quite a lot of evidence that suggests that simple learning processes like these are the basis for some of the most basic rules of thumb—what psychologists call *heuristics*—that guide us through our lives. We learn, from a very early age, that cause and effect are related, and we're always on the lookout for such links because they're excellent mental shortcuts, and very important if we're in a hurry, or tired, or hungry, or distracted by the kids, or simply too lazy to be bothered to think.

To be frank, it's quite hard to think of an environment more likely to give someone intermittent reinforcement of their beliefs than financial markets. If you wait a while, pretty much everything that can happen will happen. So if someone develops a pet theory about how and when they're successful, which occasionally works and which they never test with real data, it's quite easy to see why they'll continue to persist in damaging strategies in the teeth of the evidence. Stock markets, and other investment markets, are terrible places for humans operating on these legacy heuristics because it's all too easy to learn the wrong lessons from a few samples.

Research into the way that American investors in 401(k) investment plans operate suggests that pigeon type behavior definitely isn't confined to the birds.[4] Investors whose plans make high returns invest more, and investors who suffer from high volatility—wild swings in the value of their

plans—invest less, as compared to those who get the opposite results. Having looked at a number of other possible explanations and dismissed them, the researchers concluded that this looks like basic reinforcement learning in action, where people simply extrapolate from their personal experiences that what's worked in the past will continue to work in the future. In everyday life, as a general rule-of-thumb, that's a valid approach but sadly the future performance of investment plans isn't predicted by their pasts, so the lessons learned aren't much more useful than doing a funky head bobbing, side to side dance. It's fairly typical of how basically sound heuristics fail when it comes to managing our money.

It's very hard to avoid developing investment superstitions, because they're attractive shortcuts, which means we don't have to do any hard work thinking about our investments. The only way to manage this is to actually test your theories. That's easier said than done, but the trick is to keep track of your investments and returns properly. Don't rely on your gut feeling because you'll be wrong—often surprisingly wrong.

For example, when Markus Glaser and Martin Weber analyzed how inexperienced investors operated, they uncovered that most of them didn't have a clue whether they were making any money or not, which suggests that they're highly unlikely to be learning anything much at all from their experiences.[5] If you're not getting any feedback then you're not going to change any investing superstitions you might have acquired along the way, like taking tips from strangers on Internet bulletin boards, reacting to TV pundits, "buying on the dips," or any of the myriad other ways there are of losing money in stocks. It's a simple, but important rule: make sure you know what your returns are, and analyze why things go wrong. Otherwise, you'll likely keep on repeating the same mistakes, just like Skinner's pigeons.

LESSON 3

Be very careful that you don't develop investment *superstitions*, based on your own personal experiences. These will fail just as soon as you really need them to work, but will probably offer enough *intermittent reinforcement* to keep you trading for far longer than is wise: make sure you know your investment returns and make an effort to learn from them. Bird-brains are for the pigeons, we don't have to behave the same way.

THE SUPER BOWL EFFECT: IF IT LOOKS TOO GOOD TO BE TRUE, IT IS

All too often, spurious patterns and superstitious thinking accidentally produce the right results and then get dressed up as good investment advice. Smart investors need to hone their critical faculties to detect these fake tools, in just the same way they need to be wary of people who claim to have a perfect investing strategy. For example, take the Super Bowl effect.

The Super Bowl effect states that the conference of the winner of the Super Bowl predicts the direction of stock markets in the following year. If the NFC team wins the markets go up, if the AFC team wins they go down. This is a completely crazy idea, yet it worked 28 years out of 31 between 1967 and 1997. Despite being an impressive result, it's certainly a complete coincidence. Consider that it was equally possible to predict the winner of the Super Bowl from the direction of the stock market: do you believe that's likely?

Of course, no one does. The winner of the Super Bowl is determined on the field of play through the relative strengths of the teams. We can roughly conceive of the things that will make a difference—strategy, individual battles between players, snap decisions by coaches and the quarterbacks, and so on—and we recognize that there's an element of luck involved. But, by and large, we feel comfortable that we understand the range of probable outcomes and what will determine them. No sensible football fan really thinks that the whims of Wall Street's finest will decide who carries off the spoils.

The stock market is swayed by infinitely more complicated factors than the result of the Super Bowl: political decisions, economic factors, mass psychological trends, consumer confidence, changes in population demographics—a whole range of stuff that no one in their right mind thinks they can forecast with any real chance of success (the fact that there's a whole industry dedicated to trying to make such predictions doesn't make that last statement any less true). So why on Earth would anyone think that the result of the Super Bowl could possibly influence market returns?

Well, of course, it's about our need to try and predict the future on the basis of experience using whatever patterns we can detect. The fact that financial markets are so darned complicated that even the most clever people backed up by the most powerful computers in the world don't have more than the faintest clue what they're going to do next doesn't stop us from trying to do this, and we latch onto any random superstition that seems to help us.

So, we need to be suspicious of simple explanations and surefire investment plans. If it looks too good to be true, it undoubtedly is. No one with

a basic understanding of investment could have possibly believed the returns that Bernie Madoff was making for years, yet many intelligent people happily gave him their life savings, having apparently taken leave of their critical senses. Hone your sensors to detect rubbish explanations because as soon as you start to trust them they'll fail on you, with disastrous financial consequences.

LESSON 4

Beware of simple explanations for complex market movements and surefire techniques for making money. Remember that the *Super Bowl effect* doesn't predict the movement of markets any more than markets predict the outcome of the Super Bowl. Learn to be skeptical in the face of investment theories.

YOUR FINANCIAL HOROSCOPE: FORECASTING AND THE BARNUM EFFECT

Unfortunately, there are lots of people around who will try to take advantage by using our biases against us. We're amazingly credulous about "expert" opinions, especially when they're designed to trigger our capacity to look for patterns and meanings where none exist. For example, take horoscopes.

Most sensible people don't really believe in horoscopes even if they occasionally glance at them for amusement. Yet when it comes to investing we're happy to rely on the financial industry's equivalents: newspaper articles, stock-tipping magazines, and investment reports. It's a bit of a shock to realize that these expensive and professionally produced pieces of stock analysis are about as reliable a way of forecasting the future as the mystic divining of astrologers, soothsayers, and necromancers. They all rely on a simple behavioral trick, known as the Barnum effect, using your brain's own preferences to fool you.

Consider the following horoscope, and think about how closely it fits your personal situation:

> *You have a great need for other people to like and admire you. You have a tendency to be critical of yourself. You have a great deal of unused capacity, which you have not turned to your advantage.*

> *While you have some personality weaknesses you are generally able to compensate for them. Your sexual adjustment has presented problems for you. Disciplined and self-controlled on the outside, you tend to be worrisome and insecure on the inside. At times you have serious doubts as to whether you have made the right decision or done the right thing. You prefer a certain amount of change and variety and become dissatisfied when hemmed in by restrictions and limitations. You pride yourself as an independent thinker and do not accept others' statements without satisfactory proof. You have found it unwise to be too frank in revealing yourself to others. At times you are extroverted, affable, sociable, while at other times you are introverted, wary, and reserved. Some of your aspirations tend to be pretty unrealistic. Security is one of your major goals in life.*

Could this be describing you?

In 1949, psychologist Bertram Forer[6] presented this to each of his students, telling them it had been individually customized for each of them, asking if the horoscope accurately represented them. Most of them agreed that it did, even though they were all presented with exactly the same statement. It's basic human nature to see insightful information in random rubbish: we read into information what we want to, based on our own experiences. This is the *Barnum effect*, named for the famous entertainer P. T. Barnum, who observed that "we've got something for everyone" even though it would have been truer to state that everyone had something for him—their money. As Forer noted of his students:

> *It was pointed out to them that the experiment had been performed as an object lesson to demonstrate the tendency to be overly impressed by vague statements and to endow the diagnostician with an unwarrantedly high degree of insight. Similarities between the demonstration and the activities of charlatans were pointed out.*

If you were to replace the word "charlatans" with "stock market forecasters" you'd be getting close to the truth in our investing world. In general, we look for evidence to support our hypotheses, not to reject them—so when we're presented with random information we look for things we recognize and then latch onto them. It's an advanced form of illusory pattern recognition, but a biased one: If the horoscope above had contained mainly negative statements do you think the students would have agreed that it described them? Would you?

LESSON 5

Be wary of anyone who confidently predicts market movements: at best they're trading on the *Barnum effect*, trying to deliberately exploit your tendency to think "experts" know more than you do. At worst they believe their own shtick. Remember that we always look for evidence to confirm our beliefs, so be careful when you hear or read something that makes you feel good about yourself or your investments.

UNCERTAINTY: THE UNKNOWN UNKNOWNS

You may have noticed a couple of themes so far in this chapter. The first, obviously, is about pattern recognition, why we rely on it and how it keeps on leading us into investment mistakes based on superstitions and plausible but unprovable theories. The other one is that markets are very unpredictable places, which is why our patterns don't always help us as investors. There's a technical term for this, known as "uncertainty," and understanding this is a key takeaway from this chapter.

Uncertainty is an odd concept, but for our purposes we can think of it as the stuff that happens in the world that we can't predict. Former U.S. Secretary of State Donald Rumsfeld called these the "unknown unknowns": the things that we don't know we don't know. The unknown unknowns of the world are always with us, but a lot of the time we ignore this uncertainty. Roughly, if you feel confident about the future, if you believe that your job is going well and the mortgage is going to be paid, you're pretty certain about things. On the other hand, if the direction of future events is cloudy and you're worried about what's going to happen next then your level of uncertainty is rising, because the unpredictability of the world—its unknown unknowns—are becoming more apparent. I'd stress the word "apparent": the unknown unknowns are *always* with us, it's just sometimes we don't realize it.

In general, we're quite good at assessing actual risks when we have real data and the time to think about it, and at judging what to do next based on the information we have on hand, but we're useless at coping under conditions of uncertainty where, by definition, no one has a clue what to do. As we saw earlier, in the section on Illusory Pattern Recognition, putting professional investors in conditions of uncertainty means they're more likely to develop conspiracy theories, see visual patterns in random static, and lose money in markets by following mistaken superstitions—and these are the people who are most familiar with these conditions.

Uncertain conditions are those that are most likely to cause us to generate the random connections between events that, to all intents and purposes, look like superstitions. The key to these superstitions is that they allow us to try and exert control over the uncontrollable: they turn the unknown unknowns we can't control into knowns that we can. As investors, this means we start thinking we can predict the future, when the truth is we haven't got a clue. What do you think happens when an investor starts making investment decisions on the basis of illusory patterns? Yep, they tend to lose a ton of money.

In fact, there's evidence that the longest serving investors on Wall Street are those who tend to sit on their hands during uncertain and volatile conditions.[7] This is perfectly sensible behavior for people who are generally good at predicting the movements of markets and stocks: Why take big risks when you don't know what's going to happen next?

LESSON 6

Remember that the movements of markets are not in your control and resist attempts to create imaginary methods of exerting it. Embrace *uncertainty*: it's always with us, it's just that we don't always realize it. Remember that the best investors tend to sit on their hands when uncertainty is especially high: sometimes doing nothing is just fine.

ILLUSION OF CONTROL

The superstitious links we create in uncertain times are all about trying to make ourselves feel as though we're in control, when really we aren't. This effect, known as the illusion of control, is a very powerful behavioral instinct. Unfortunately, it turns out that the more you are in thrall to the illusion of control the more likely you are to lose money.

There are lots of examples of how the illusion of control leads us into error. Take flying or driving for instance. You and I will probably both agree that we *feel* safer driving, but the statistical evidence is overwhelming that we're actually much safer flying on a commercial airline. It's now well established that in the wake of the 9/11 Twin Towers attack a further 1,600 people died on America's roads during the subsequent year as a result of switching from air travel to road transport.[8] A similar argument can be made around the decision about whether to invest actively, making your own stock choices, or passively, by investing in an index tracker. The former makes you feel like you have more control but actually exposes you to all sorts of new ways of losing money.

In fact there are probably good reasons for us to want to take control of our lives, because feeling we're not in control is bad for our health. In a rather scary study, psychologists Ellen Langer and Judith Rodin showed that giving old people in a retirement home even very small amounts of control—a plant to look after, or self-determination of when to watch a movie—didn't just improve their quality of life, but increased their life expectancy.[9] So, our quest for control, even when it's through foolish superstitions and irrational links, is actually entirely rational. Even the illusion of control may be health giving.

Famously, Ellen Langer has carried out a whole range of experiments that show that people will do all sorts of strange things in order to make themselves feel that they're in control of their environment, even when they blatantly aren't. For example, in a rigged coin tossing test participants were asked to predict the outcome of 30 coin spins and were given feedback as they went along.[10] Although everyone was given a 50 percent "correct" result overall, some people were told that their early guesses were right. These people, the ones who got early positive feedback, developed a belief that they had some skill at coin tossing, and promptly overestimated their overall success rate.

This type of pattern is quite common in investing careers—some people will get lucky early on and develop beliefs that they're "naturally" good at investing. It's not hard to see why this initial success can lead to unrealistic expectations about the amount of control and skill they're exhibiting. Unfortunately, when it comes to stock markets the evidence is that most of the time what happens is largely random; even though there's an entire industry devoted to doing nothing but analyzing the data in order to make predictions its record is not far short of disastrous, especially when it comes to the turning points of markets. These types of situations are simply full of unknown unknowns, and we'd expect this to offer up many examples of people forming illusory links between events and then acting on them in order to maintain an illusion of control.

Here's further proof—a study of professional traders[11] exposed to fairly normal looking, but actually completely random, conditions concluded that many of the participants demonstrated illusion of control problems. Notably, the individuals who were most inclined to illusions of control were also most likely to perform the worst: they were more likely to see their successes as evidence of their skill, and to take more risks because of this—they simply failed to recognize the limits of their own abilities. In essence, the more deluded the individual trader was about their own ability to influence outcomes, the poorer their investing results were.

Thinking we're in control when we're not is always a dangerous illusion. For investors it's a guaranteed way of losing money and the safest position to adopt is that in the short-term markets are always unpredictable. Many people find that almost impossible to accept: they shouldn't be allowed anywhere near stock markets.

LESSON 7

If you think you can predict stock markets in the short term you're wrong: this is just the illusion of control trying to make you feel better. If you feel especially confident, be careful that you're not overreaching: try imagining how you'd feel if all your investments went bust. And if your financial adviser makes short-term market predictions, ditch them: they're hazardous to your wealth.

STOCKS AREN'T SNAKES

Of course, when uncertainty really rears its ugly head in the form of major economic turmoil the fact that we don't really have any control becomes perfectly clear. In uncertain conditions our general pattern recognition rules of thumb for proceeding will tend to go wrong and we'll react to this. Our default reaction to situations involving high levels of uncertainty is carefully designed to keep us alive in the jungle, by fighting or running away, but is perfectly useless for investors who need to learn to keep calm when every nerve is screaming at them to panic. Investors should never make rushed decisions.

Some market panic or other will strike at least a couple of times a decade. Cheap stocks will get cheaper, the go-go-growth stocks we've learned to love will suddenly turn turtle, companies that produce improved earnings year after year will suddenly announce profit warnings, and buying on the dips will just increase our losses. You'll become unsure as to how to proceed. You'll feel fearful and nervous, and prone to try and react to remove these feelings.

Usually we feel like this in situations where we really need to react quickly, and our nervous systems are set up to make fast decisions in these conditions, based on whatever rough and ready rules we can quickly bring to mind. We're far better off reacting 99 times to a stick that we think is a snake and once to a snake that is a snake than we would be sitting around carefully considering whether that snake-like object is actually a stick—because it only takes one stick to be a snake for us never to have to worry about thinking about anything ever again.

Investment is different: we can get bitten frequently by poisonous investments and still do okay. So a rule of thumb that saves us in the tropical jungle is not going to work in our modern investment equivalent because it is almost never necessary to react quickly in stock markets—these are not time-critical decisions.

Putting people under time constraints to make difficult decisions is an old compliance trick used by sales people. They know that giving you a short window of time to make a decision puts you under pressure and is more likely to cause you to react irrationally. Of course, the fact that they feel they need to do this should immediately raise your suspicions and this applies doubly to investment decisions which, even in conditions of uncertainty, should be made calmly and in slow time: making them quickly accentuates a whole range of other bias related problems. Putting yourself under time pressure isn't just stupid, it's also likely to be very, very expensive.

When we make decisions quickly we engage the old parts of our brain that are set up to react quickly to keep us alive. By slowing down we give the newer forebrain, where logic and rational thought is generated, the chance to take charge and make rational choices. No matter how urgent that stock tip is, or how quickly your broker or adviser wants you to trade, you're always better off sitting back and thinking about it. Any financial decision that can't be slept on should be firmly ignored and any financial adviser that pressures you into making a quick decision should be fired.

LESSON 8

Mistaking a stick for a snake can save you from a potentially dangerous situation, but mistaking a stock for a snake is not as helpful. Don't make snap judgments about investments: time is your friend and investment decisions are almost never really *time-dependent*. Stocks aren't snakes, although they can bite you if you're unwary.

HERDING

Uncertainty has another, quite odd, effect on the way we behave. If you look at how stocks perform when we're deep in conditions of uncertainty you'll see that they tend to synchronize—everything tends to go up and down together. This is a sign of a very common investor behavioral trait known as herding, where we copy each other. Like so many other biases this behavior is programmed into us, is a sensible rule of thumb in everyday life, and is perfectly wrong for investors who are likely to follow the herd leaders right over the nearest investment cliff.

On the rare occasions when anyone is foolish enough to invite me to a vaguely up-market sit-down dinner I can never remember whether my bread roll is on my right or my left. So I do what everyone does, and wait

for someone who can remember to eat their roll first, and then hope I'm not following the only person at the table who doesn't care or know about social conventions. We copy each other when we don't know what to do. So what do you think we do when no one knows what to do?

Well, when we're exposed to conditions of uncertainty, such as our bread roll conundrum, following what other, confident looking people are doing is often a very good heuristic. So, we adjust our investments based on what other people are doing, rather than through any fundamental analysis of our own.

This is what's happening in markets when stocks start synchronizing. As Research from the New England Complex Systems Institute has shown that as uncertainty increases so does the tendency for stocks to move together.[12] These synchronized moves are an outward sign of investment herding, as sentiment changes on a daily basis. The problem is that there will always be some people who are confident, even though they don't actually have a clue what's really going on, and if we follow them we're outsourcing our judgment to other people who have no better ideas than us, but either make a living pretending that they do, or simply don't know that they don't know.

The weight of evidence, built up over years of research, is that social effects such as herding are very powerful forces in investment markets. These apply to you and me, but also to professional investors, who are just as biased by their brains as everyone else. Studies of professional stock market analysts frequently demonstrate both herding and a lack of ability to forecast. When the economist Hersh Shefrin[13] analyzed the performance of the forecasters both before and after BP's *Deepwater Horizon* oilrig spectacularly collapsed, he found that herding in forecasts increased after the event, as the highly paid analysts huddled together in an acute state of uncertainty—and they still got their forecasts wrong, on the high side as usual. Obviously, none of us like to think that we're simply a steer in a herd of stampeding cattle, but in conditions of uncertainty this is often what we're reduced to if we're not careful, with no idea if our leaders are heading towards the high ground or the edge of a canyon.

Oddly, though, we don't just herd when we're uncertain of what to do next. Its exact opposite can cause this as well. Hands up—who threw money at dot-com stocks at the end of the last century? Many people invested in these for no better reason than everyone else was doing so, and the more people threw money at them the more they went up and the more people wanted to own them. Of course, feelings of uncertainty were very low at that point—everyone felt confident about the future of the Internet, so much so that they were prepared to pay any price to own a part of that future. Extreme certainty about the future is another sort of error: the unknown unknowns are always with us.

It's not true that herding is always bad for investors, but following other people and market sentiment without thinking about it is. Market trends eventually stop, and the only money we lose by following other people is our own.

LESSON 9

Be careful about following investment trends. *Herding* is not always bad, but you may eventually end up in a canyon, and blaming other people for your losses when you're upside down in a hole with a heifer on your head doesn't make them any less real.

Salience

Conditions of uncertainty also trigger another reaction: they get lots and lots of mass media attention. Let's face it, there's no story in nothing much happening in the world, but if something extreme is going on—like a major stock market crash—then that's newsworthy. We're social creatures, we're interested in what other people are doing. The mass media is the modern equivalent of us running around our friends telling them about the nasty accident with the mammoth. These stories, whether sensationalized or not, are what tend to stick in the mind—they're salient and they resonate with us, particularly when we have money at stake or we think our loved ones are at risk.

Salience is an important concept, because we're particularly driven by events that have meaning for us. You tend not to pay much attention to stories that don't affect you, but you'll be absolutely drawn to those that you have an interest in. Of course, news outlets know this, and they know the hot buttons to press—stories about child molesters, nuclear disasters or stock market crashes or celebrities to whose lives we aspire, and so on. As research has shown, the effect of these stories is to give people a disproportionate view of the risks involved. We worry more about the tiny chance of a nuclear disaster than we do about the radiation we get from X-ray machines—yet scientists rate the latter as much more dangerous in aggregate. Of course, this is linked to the uncertainty—the unknown unknowns—associated with nuclear power coupled with the potential for utter catastrophe. There's a term for this fear of extreme events—dread risk—and situations characterized by both dread and uncertainty seem to provoke extreme reactions.[14]

The impact of the salience of events combines with some of the other factors we've already discussed—in particular, our tendency to use observations from our own experience—to generate illusory patterns, which we then use

to predict the future. Scare someone enough with a salient story about how child molesters are prowling our suburbs and you get people extrapolating to their kids, and a generation who aren't allowed outside without supervision.

Similarly, if you put someone in conditions of uncertainty and then bombard them with frightening information about the dread risk of stock market crashes then you're quite likely to get a reaction, as people either become paralyzed into inaction or, just as likely, start taking inappropriate countermeasures, selling stocks when they shouldn't and buying them at equally inappropriate moments.

The effects of salience can be quite odd. You probably have experienced bad service at some outlet or another, from time to time. Some people take such experiences and extrapolate them to an entire firm. Sometimes this may be valid, but often it isn't—developing a dislike of a company simply because one person got out of bed on the wrong side one day is just silly, but seems to be a quite common reaction. However, some companies can get away with bad service all the time, because they're so powerful—sometimes bad service is the sign of a good investment. Not often, though, and hopefully not for long.

The use of single anecdotes to justify major decisions is the stock-in-trade of politicians and other influencers who know that nothing sells a policy like a good human interest story. From our perspective, though, a single anecdote is just one data point—to make decisions we should be looking for hundreds, if not thousands, of similar anecdotes, and not rely on our own limited personal experiences.

LESSON 10

Be wary of sensationalized stories; they're written because they're salient for us, and they're not representative of the entire world. This is particularly true in situations evoking dread risk, such as the threat of the end of the known investment world destroying your life savings. Look for real data, not stories.

AVAILABILITY

Salience has one further impact, which is that it makes information easily available to our brains. Availability is, perhaps, the single most important behavioral bias we'll meet because it's implicated in so many different situations. Yet it's a very simple concept—availability is a key aspect of how

we make decisions because we will tend to use information that is easily retrievable from memory—the information that is most available. When it comes to investing our recent experience is not a good guide to future performance, and investing on the basis of whatever we can easily bring to mind is a one-way ticket to the poorhouse.

Obviously, information that is very salient is also information that is very available—if you're considering whether or not to let your kids go play in the park you'll likely be drawing on your experiences of similar events and any stories about lurking threats from shadowy stalkers. This information is easily retrieved from memory. The statistic that the total of non-family related child abductions in the United States in a typical year was a total of 115 children and youths[15] is not, as it's not remotely sensational, rarely publicized, and hardly salient.

This, on a lesser scale, is the kind of logic that goes into many decisions. Again, remember the research that showed many more people dying on the roads after 9/11? This event is seared into people's memories, and it takes a considerable time before the memories recede sufficiently enough for the increase in traffic deaths to decline as people returned to flying. Similarly, many people who lived through the Wall Street Crash in 1929 never forgot the lesson to avoid stocks—even though investing in American stock markets from around 1933 through 1965 would have proved to be one of the best investing decisions anyone could ever have made.[16]

One of the greatest investors of all time was Ben Graham, often known as the "father of investing" and the mentor of Warren Buffett, billionaire chief executive of Berkshire Hathaway. Graham lost a fortune during the Wall Street Crash, although he made it back in the years following. His investment style from then on was intensely cautious, a style that worked extraordinarily well in the markets that followed the market collapses of 1929 and 1931. However, his experience was so salient that he retired from investing in 1956 because he thought markets were too high. They continued to rise for another decade and, despite all the trials and tribulations of the world since, have never fallen back to the levels at which he decided they were too risky. That's salience and availability in action, and it affects us all, even the very wisest of us.

The only way for investors to guard against the effects of availability is to have a strategy, which means you don't have to rely on salient information like this. To do this you'll need to understand a bit of history, about the returns from markets and different types of assets over longer periods, and you're going to have to learn to use wider sources of data than your own memory.

LESSON 11

We will preferentially access and use information that's easily available to us—this is often a poor strategy for investment decisions. Look for objective evidence, don't rely on subjective opinion.

ASSUMING THE SERIAL POSITION

Salience is not the only factor that affects the availability of information in your mind. Investors are particularly attracted to recent information and are also impacted by the order in which they receive information. It turns out that the order in which information is imparted changes the outcomes of our investing decisions, and often not for the better. Overcoming this requires more than simple knowledge of the problem, it means you need a system.

Here's a list—read it and memorize it quickly:

Paul
John
Michael
Roger
David
Richard
Simon
Stuart
Ian
Peter
Henry
Larry
Dan
Joe
William
Andrew

Now do the same with another list:

Ruth
Barbara
Cynthia
Joan
Amelia
Alice
Isabelle
Cathy
Susan
Deborah
Leanne
Charlotte
Kelly

Okay, now without looking back, write down as many names as you can—from the first list. (The second list was a decoy, to stop you refreshing the data from the first list in your head, not that that would help you very much.)

In general, people will preferentially remember the first name and the last name on the list. Recalling the first and the last names is known as the primacy effect and the recency effect—the first and most recent items on a list are more memorable than the others, all things being equal. This is the result of a more general bias known as the serial position effect, the finding that the order in which information is presented determines how well we can bring it to mind—how available it is. Remember the illusion of control task on coin tossing, where people who received early feedback about their "successes" began to believe they were demonstrating skill at what was an obviously random task? That was an example of how primacy can bias our judgment as we form early opinions, which we're then loathe to change in the face of new data.

Recency is particularly implicated in a range of investor misbehaviors, because we tend to overweight the importance of the most recent events and to downplay more distant ones. This can have some strange and counter-intuitive results, including the so-called gambler's fallacy. This occurs when people believe that a run of luck—such as black turning up on a roulette wheel multiple times—means that a reversion is more likely—so that red is predicted for the next spin. But the spin of a roulette wheel leads to random outcomes and the previous result doesn't predict the next one.

Mostly, markets are also random, so a few days of a stock going up or down is likely to have no cause whatsoever, but recency effects such as the gambler's fallacy seem to bias some people into expecting a change of direction. However, others will develop exactly the opposite hypothesis and assume that a particular sequence will carry on, presumably forever.

The rough rule here is that you shouldn't assume that recent events tell you anything about the longer-term trajectory of stocks or markets. Investment decisions should be based around a longer-term view of corporate prospects and an understanding of the risks involved. Because we find it difficult to overcome these problems, even if we recognize them, we're going to need to develop processes to ensure we give all information equal weight, not just the most recent or most salient pieces.

LESSON 12

We're heavily biased by recent information, by recency, but recent events are often not a good basis for making long-term investment decisions. We need to be aware of long-term investment trends and learn how to relate these to short-term market events, and to do this successfully we're going to need some simple tools.

HOT HANDS

Another effect of recency is the idea that stocks can demonstrate "hot streaks." This is related to the deeply ingrained belief that certain sportsmen can, at certain times, demonstrate a "hot streak," in which they defy all normal levels of skill to hit home runs, ride winners, or shoot baskets at will. This, the so-called hot-hands effect, is nothing more than the all-too-human tendency to see order in random patterns, plus the impact of recency, as we just look at the recent results and ignore the long-term trends. Extrapolating from recent market behavior to the future, or from a stock tippers' recent results to his or her next ones, is a dangerous tendency.

For example, take the following four sets of coin tossing results. Which one wasn't generated at random?

1. T H H H H T T T H H H H T T T H
2. H T T T T T T T H T H T H T H H
3. H T T T T T H T T H T T T H H H
4. T H H T T H T H T H T H T H H T

The actual answer is number 4, which I made up to try and make it look roughly random, and without trying managed to end up with equal numbers of heads and tails, although most people would probably reckon that's the most likely candidate for a really random set. However, the other three sequences, all of which contain long runs of heads or tails, and unequal numbers of each, are completely random: in fact in a really big, really random set of coin tosses you'd find sequences of hundreds of successive heads or tails. In reality, you need about 200 coin tosses to be reliably able to tell the difference between a true random sequence and one that's generated by a human—but it's nearly always possible to tell, as long as you know what you're looking for.*

So, when we see a sportsperson on a hot streak what we're generally seeing is someone at one point in one of these sequences. This isn't to say that a good player won't get better results than a bad player, but it is saying that one good player won't get better results overall than another good player if you look at the complete data set, rather than just the most recent bit. Once again, what we're seeing here is the human brain looking at a small part of a random pattern and discerning order where none exists. It's a sort of pareidolia applied to data—we're seeing the Man in the Moon again.

In general, the world is a disorderly place, full of random events. We're attuned to look for cause and effect because where we find order we generally find human beings at work, turning the randomness of the world into something less perplexing. So, order is a sign of some kind of a directing mind, someone in control and, in the main, that someone is another human being. Of course, where there is apparent order, which couldn't have been created by humans—such as the so-called face of Mars—some people leap to the conclusion that we're looking at the work of alien intelligence, rather than reaching for the more prosaic explanation of pareidolia.

Hence, when we see something that looks like order we usually attribute it to human intelligence and skill. Unfortunately, recency means that we only tend to look at the most recent events in a long sequence, those which are available to our brains, which means we can be fooled into thinking we're

* In "The Impossibility of Faking Data," Theodore P. Hill recounts: "To demonstrate this to beginning students of probability, I often ask them to do the following homework assignment the first day. They are either to flip a coin 200 times and record the results, or merely pretend to flip a coin and fake the results. The next day I amaze them by glancing at each student's list and correctly separating nearly all the true from the faked data. The fact in this case is that in a truly random sequence of 200 tosses it is extremely likely that a run of six heads or six tails will occur (the exact probability is somewhat complicated to calculate), but the average person trying to fake such a sequence will rarely include runs of that length."

looking at the results of skill and intelligence when actually all we're seeing is a snapshot of a small sequence of the output of a coin tossing machine.

So here we have pareidolia, illusory pattern recognition, superstitious thinking, availability, and recency, all combining to create the hot-hands effect. It's the combination of these behavioral effects that make a compelling story for our brains. When you apply this kind of analysis to stock market investors you can suddenly see why markets can get on a roll for reasons that have nothing to do with the true valuation of the underlying securities. Most stock price changes, for instance, are nothing more than random jitters in the system for which no explanation is ever required—yet you can find people obsessing over every miniscule movement and explaining them in terms of some causal event. If a stock you own happens to start traveling in one direction for a number of days in a row this can provoke all sorts of explanatory storytelling, yet if you look at the long-term price movement in terms of actual earnings events you'll probably see nothing more than a random sequence.

These kinds of short-term effects, triggered by combinations of behavioral biases, almost seem to compel people to make investing decisions, yet they're irrelevant to the proper business of stock analysis and long-term strategy required to be successful in markets. In fact, the overreaction of people to recent information may offer up attractive opportunities for investors with longer investing horizons, while that very overreaction will damage investor returns through overtrading and excess fees.

LESSON 13

The hot-hands effect is caused by only looking at a small snapshot of a much longer sequence of data. It's an example of recency, where we are biased by the latest available information. Try to look at the bigger picture: don't expect an average slugger to keep on hitting home runs, and don't expect a biased investor to even make average returns.

FINANCIAL MEMORY SYNDROME

You've probably noticed that the ideas of salience and availability, along with the gambler's fallacy and the hot hands effect, are linked to our abilities to remember and recall information, but they're only a few of the memory-related problems that investors suffer from. In particular, we have a problem when we're bombarded with lots of information because in that kind of situation we tend to focus only on the most memorable stuff. Company

managers and others know this and will tend to highlight the information they want us to see, and hide away information that they don't. Unsurprisingly, the hidden information is often the stuff we really need to read.

Usually, we treat memory as unproblematic, a sort of photographic repository of stuff that's happened to us. In fact, it's anything but photographic, because we recreate memories on-the-hoof as we need to. Recent events color past ones, and our memories are constructed out of the bits and pieces we can actively bring to mind: which means that if you can plant a story in someone's memory you can get them to "remember" things that never actually happened. This problem, known as *false memory syndrome*, was shown quite startlingly by the cognitive psychologists Elizabeth Loftus and Jacqueline Pickrell,[17] who were able to convince various people that they'd had experiences which were, in fact, entirely fictitious. Indeed, their research subjects then elaborated the stories with details of their own, and later found it hard to believe that the fake memories weren't real.

The practical applications of this finding are really important—uncorroborated witness statements aren't a safe basis upon which to make criminal convictions, and reports of child abuse by individual victims are suspect, especially when recalled out of the blue after therapy or if prompted by authority figures, and we simply can't always accurately remember the past performance of stocks and markets. It turns out that many of us think we actually had quite severe reservations about whether to invest in stocks in late 2007 or real estate in 2006—only we didn't of course, it's just that's what we think we remember.[18] Mostly, we were still investing like lemmings on a day-trip to the nearest cliff top.

These problems are associated with long-term memory, the stuff we think we recall, but there are a whole other set of problems with short-term memory, which is where we store information so we can work on it moment by moment. Remember the lists of boys and girls names we saw previously? Well, those lists were far too long to remember, because working memory, as short-term memory is called, can generally only hold about seven items of information.[19] If we try to hold more than seven we start to lose data, a phenomena known as *information overload*: initially, as we add more data our decision making improves, but this rapidly plateaus and then goes into decline as we hit the limits of our working memory. After a while, we stop taking notice of most of the information presented and availability effects start to predominate.

If you've tried to read a corporate report recently you'll know exactly how this works—huge amounts of information provided in order to meet regulatory requirements, most of which gets ignored in favor of reading a few choice bits. It turns out that the old saying "less is more" was never more applicable—we really only pay attention to the most salient and vivid

pieces of information, especially if they're presented in an easy-to-consume form. Unsurprisingly, our limited abilities to attend to complex pieces of information will tend to get exploited, and there's evidence to suggest that company managers try to manipulate highly visible and easy to understand financial ratios like the earnings-per-share, and hide expenses and liabilities in less visible locations—exploiting both salience and availability.[20]

If this sounds like a minefield for the unwary investor then you're getting the idea. A whole industry has evolved to exploit our cognitive biases and use our own minds against us. Fortunately, because most people don't realize this it's quite easy for those of us who do to develop some defenses against this exploitation. Keeping an investment diary is a good start, making sure you record your decisions and reasoning, and frequently revisiting it to refresh your memory. Above all, you need to analyze your mistakes in light of subsequent experience—successful investing is mainly about avoiding big mistakes, not finding big winners.

LESSON 14

Beware of using your unaided memory to process comparisons and of situations in which you're being asked to process lots of information. These can lead to false memory syndrome and information overload problems. Keep a diary, and make sure you understand your mistakes. Everyone makes them, most people don't learn from their experiences.

ATTENTION!

The trick to making the information someone wants us to look at highly visible is actually exploiting another, quite simple, human limitation. If you've ever got stuck on a narrow sidewalk behind someone trying to walk and text at the same time you can testify that we find it difficult to attend to more than one thing at once, even when one of them is as automatic a function as walking. This behavior lies behind the research that shows that if we acquire too much information we actually *reduce* our rate of investing success: information overload again.

The problem of divided attention due to too much information is why various states and countries have banned the use of cellphones and other hard-to-use gadgets in cars, because they cause us to lose attention from the rather more important business of trying to drive in a straight line—and if we stop attending to the road for more than two seconds the probability of

an accident increases dramatically. Having too much information available erodes our ability to focus on the salient points, and reduces our performance.

The evidence for information overload comes from multiple sources. The classic study involved horse handicappers and showed that increasing the data available to them beyond five items and up to 40 slightly *decreased* their success rate.[21] Similar results have been found for doctors, clinical psychologists, and, of course, investors. As the Internet makes ever more mountains of information available to us this problem is likely to get worse, unless we take steps to deliberately focus our attention on the things that really matter.

The problem, of course, is deciding what's important and what's not. Combating the problems of information overload and our limited attention capability means we need to develop techniques to help us because our memories simply aren't good enough to do this unaided. Even an investing diary isn't going to be much good if we don't develop a systematic way of analyzing the results. Probably the best way of doing this is to create a checklist.

Checklists are incredibly powerful—they help to turn difficult analytic problems into simple lists, to allow us to identify the key issues for any given investment. They also force us to look at "obvious" things that our biases will otherwise cause us to neglect. In general, every investment has its potential downsides so the important thing is to isolate them and then focus our attention on them. Checklists help to remove some of the subjectivity associated with investing decisions, although they're always going to be more effective if you develop your own.

The power of checklists is testified to by their use in safety critical industries, where missing important issues due to attentional weaknesses can result in disaster. When Captain Chesley Sullenberger and copilot Jeff Skiles successfully guided their crippled plane onto the Hudson River and to safety on January 15, 2009, they did so by rigorously following the checklists set out in front of them.

Skill matters, but if it's not accompanied by focused attention then it's not going to be of much use to you. And, frankly, if a checklist can help land an Airbus on a river it's probably good enough to help make you a better investor.

LESSON 15

Don't let yourself be distracted from important tasks like driving or investing: make sure your attention is focused. Build your own checklists ahead of time and apply them consistently.

THE PROBLEM WITH LINDA

This chapter has been all about how our senses and our memories can deceive us, particularly in uncertain times, and how the resulting mistakes can manifest themselves in investing errors—mistakes that the financial services industry is all too ready to exploit. We'll end this excursion into the peculiarities of perception with an example that superficially looks completely different, but which turns out to be one of the most important pieces of the puzzle that is behavioral finance. It's a famous piece of research known as the Linda problem:

> *Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations. Which of these two alternatives is more probable?*
>
> *a. Linda is a bank teller.*
> *b. Linda is a bank teller and is active in the feminist movement.*

Okay, so what do you think?

The Linda problem was created by a couple of young researchers, Amos Tversky and Daniel Kahneman, in 1974,[22] and was the start of a revolution in economics, what we now generally call "behavioral economics" or "behavioral finance." In 2002, Kahneman justly won a Nobel Prize for this and their later work, a prize Tversky would have shared had he not died in 1996. The answer that you probably gave—and that most people who haven't seen this before also give—is that Linda is a bank teller *and* a feminist. This is very, very wrong.

It's wrong firstly because of something called the conjunction fallacy. To understand this, consider which of the following is more likely?

a. Linda is a woman.
b. Linda is a woman and 31 years old.

Of course it's not more likely that Linda is a woman *and* 31 years old than it is she's just a woman. This is always true whenever one of the options has that "and" in it: the "conjunction" of the conjunction fallacy. So why do most people reckon Linda is a feminist *and* a bank teller?

It's because of the additional information provided in the question, which seems to suggest she's a bit of a do-gooder, with leanings towards social responsibility. This extra information *primes* our brains into thinking about the sort of people that would be inclined to this sort of behavior, so

when the question suddenly includes "feminist" a bunch of easy to find positive matches go off in our heads because the priming has made them available to us. This is yet another aspect of availability.

Priming causes all sorts of surprising behavior. One of its effects is that you may have got the Linda problem right—because this book has by now, I hope, primed you to expect the unexpected. This is exactly the problem that many researchers face, and they have to find sneaky ways of overcoming this bias. One of the most clever was carried out by John Bargh and colleagues,[23] which showed exactly how powerful priming is.

Firstly, he got his participants to carry out a word-related test, unscrambling muddled up sentences. However, this wasn't the real experiment, which was to measure the speed with which the people exited the laboratory facility. What was being investigated was the effect of priming some of the participants with words related to being old—old, lonely, wise, knits, and so on. Those so primed were significantly slower to walk to the lab exit. Aside from priming, this is an example of the ideomotor effect, where suggestion or expectation unconsciously affects motor behavior, the processes behind physical movement. The ideomotor effect has been known about since 1852, when William Carpenter used it to provide a non paranormal explanation for various sorts of magical hocus pocus, like divining for water and magic pendulums. It's also the unconscious force behind the "success" of Ouija boards.

So, priming doesn't just change the way we think, but the way we physically act. This sort of thing is immensely revealing regarding the way our brain works, and it really makes perfect sense that various terms should preprepare us—or prime us—for related information or actions. It's just that it has some very odd side effects because priming makes the targeted ideas, concepts and words highly available and this makes us very suggestible—we can easily be manipulated into giving different answers to what is essentially the same question simply by phrasing it differently, a trick politicians exploit ruthlessly.

This matters a lot for investors. A study by Dalia Gilad and Doron Kilger[24] showed that it was possible to predict the riskiness of peoples' investment decisions by whether they first primed them with stories about risk taking or risk aversion. In fact, they also showed that professional investors were more affected by priming than nonprofessionals, and suggest that this is because the professionals were relying on their experience and intuition rather than hard research to make their decisions.

The power of priming is such that we need to be very, very careful about making investment decisions when in an emotional state. As the previous study suggests, the best antidote for this is proper research, and solely relying on any expertise you've gained along the way is a dangerous and risky business. This is true for everyone—experience, wisdom, and a track record are of limited use when you're investing.

LESSON 16

Priming will bias our decision making, and can be used to manipulate us into making wrong decisions. Don't invest purely on gut instinct or experience—no matter how convinced you are of the correctness of your judgment always back it up with hard research, and allow yourself time to think through a decision. And don't make investing decisions when in an emotional state.

REPRESENTATION

If we go back to the Linda problem, the normal answer—that Linda is a feminist *and* a bank teller—is wrong for a second reason, a simple short cut known as the representative heuristic. That's a long-winded and technical way of saying we make decisions by making comparisons with whatever we can bring to mind—yes, yet another application of availability—rather than by thinking through all the possible options. For investors, this can create some really nasty problems, because if we're relying on our limited range of experiences to make investing decisions, we're virtually bound to spend most of our time comparing new opportunities with ones we've already experienced, and it's quite likely that while these may be superficially similar they'll probably really be quite different.

Specifically, our normal answer to the Linda problem is wrong because of a problem known as base rate neglect. Remember that we tend to operate on observed frequencies based on our own limited experiences, so if we're primed to look for feminists by the question then they'll be high on the list of "observations" we can bring to mind and we'll tend to ignore all the non-feminists around, and also all the ones that are bank tellers to boot. Think of it like this: if we see someone run down by a woolly mammoth then that's going to be at the front of our minds, and we'll likely ignore the fact that we've just witnessed the only mammoth drive-by accident in the whole world this entire millennium and that the risks of this reoccurring to us are vanishingly small. However, if we got a video of it we'd probably be rich.

So, the base rate for Linda is the actual number of feminist bank tellers around compared to the total number of bank tellers, and that would probably be pretty low. So even if Linda does have a few vaguely feminist leanings, it's still very far from certain that she'd be a feminist. Normally, instead of considering base rates, people try to figure out whether the description of Linda is *representative* of a feminist and, finding that it does, they jump to

conclusions: hence why this decision-making process is known as the representative heuristic, a shortcut for making decisions by comparing information that's easily available to our brains.

Of course, the fact we don't naturally make decisions by analyzing the data in detail shouldn't really be a surprise, but it does flag the fact that if we go around judging things by similarity in the investment world we're really rather asking for trouble. It's the numbers that matter and if we just skim the surface looking for simple comparisons we'll end up ignoring the details. Remember that every time you read an investment report or a statement of company earnings you'll find that you're being asked to make comparisons by people who have a vested interest in getting or keeping your money. Do we really think they'll be making comparisons based on proper base rates? Or might they preferentially make comparisons with something else that makes them look good?

If we want to see how well an investment is doing, we need to use our own data, not rely on comparisons that other people are priming us with. Hopefully, by now, you'll recognize this message: we need to create our own investment diaries, update our own investing checklists, and begin to hone our skills in specific areas. Removing our personal biases from our investing decision making is something we can learn to manage—but only if we recognize that it's a problem to start with. Fortunately, because the investing industry has such an easy time with gullible dupes we don't need to be particularly clever or skillful to avoid the obvious traps, just dogged and persistent.

For now, remember that stock markets are unpredictable and we'll try to exert control even where we can't, especially in conditions of uncertainty—so combining behavioral effects like availability, salience, herding, and pareidolia with intermittent reinforcement can lead us into making up our own random superstitions out of bits of available data and/or copying what everyone else is doing. And no one really has a clue what is going on.

In short, our brains have money problems, and they can lose us money.

LESSON 17

Priming and the representative heuristic will cause us to make comparisons with whatever we've been primed with, and you should recognize when you're being primed by stories to make comparisons with biased examples. Better still, avoid the problems of behavioral bias by developing your own tools for analyzing stocks.

THE SEVEN KEY TAKEAWAYS

This chapter has aimed to introduce you to the core concepts of behavioral biases in investing by relating them to the kinds of perception and memory issues you'll have experienced in everyday life. Many of the rules of thumb—the heuristics—we've discussed should already be familiar in other contexts. It's quite a scary thought that many of these natural traits are already being exploited by people and firms who want to part us from our money without us even being aware that we're being exploited but, fortunately, just becoming aware of the issues is an important first step to dealing with them.

To finish, let's draw together a few key ideas from this chapter before we move on. The main takeaways are:

1. We are all biased to some extent, you as much as me, but many biases are related to perception, memory processes, and heuristics, which are useful adaptations to help us get through our everyday lives.
2. These biases are almost wholly unconscious and virtually impossible to eradicate by willpower or training, although we can learn to develop techniques to manage them.
3. Our biases are exaggerated by conditions of uncertainty, such as those we regularly experience in stock markets.
4. Our biases don't just lead us into investing errors, but are often deliberately exploited by people who want to make money from us.
5. Experience is not sufficient to avoid these biases—in fact, relying on experience will almost certainly lead you into more errors by incorrectly extrapolating from local, personal examples to general trends.
6. Investing decisions—and many others—aren't time critical, and we shouldn't make them in a hurry, or in an emotional state.
7. Managing these biases requires a range of tools, such as carefully keeping track of your returns and developing a checklist of things to look at before investing. The best investors have a method, and don't simply rely on personal judgment, because they know this will be biased, however much they work at it.

That's enough for now. Don't worry about all of the details because we'll revisit and extend many of these ideas and techniques as we look at the next set of biases. These are problems that aren't based in our perception or memory processes but in our belief systems.

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