Chapter 17

The Power of the Unexpected

Unconscious Influence

Over the years I must have given well over a hundred talks touching on the subject of cognitive bias in some way. The residual effect is that anytime something comes up in the news where it appears that someone has fallen prey to it, but doesn't realize it, an article will be forwarded on to me along with the caption, "Thought you'd enjoy this one." What makes this topic so fascinating to me is the "but doesn't realize it" aspect. A subscriber once remarked to me, "I understand most of what you write about. *For me,* it's intuitive."

This belief that "it doesn't apply to me," is a fundamental aspect of the phenomenon. It's right there in the very definition of cognitive bias. An *unconscious influence* that produces systematic errors in judgment.

Here's an example of cognitive bias at work. On October 25, 2016, a conference organizer sent me a link to an article about a man who had developed a model for predicting the winner of the US presidential elections, along with the following commentary: "gotta love his quote!

AlphaBrain: How a Group of Iconoclasts Are Using Cognitive Science to Advance the Business of Alpha Generation, First Edition. Stephen Duneier.

=> 'The model predicted a Trump win in February and nothing has changed since then. **Whatever happens in the real world doesn't affect the model**,' he said." (Emphasis is the sender's.)

At the time he sent the email it appeared to most that Clinton's victory was all but guaranteed. To the person who sent it to me it seemed ludicrous that the prognosticator mentioned in the article that he wasn't updating his model as new information was being gathered. He shared it with me because he felt it served as a prime example of someone exhibiting flawed decision-making.

The question is this: For what reason should the model have been updated? This same model had been covered by the press ad nauseam when Trump first won the GOP nomination. At that time it was crystal clear that the model had accurately predicted the winner in all but one presidential election going back to 1912, and it had done so without gathering additional data after the primaries. If there was a flaw in ignoring postprimary data, it should have been pointed out back then, but it wasn't. However, because his model had predicted a Trump victory, and the latest polls had swung so far in the opposite direction, his model suddenly appeared deficient and his defense of it categorized as absurd.

Changing his model to reflect the latest polls or anything else simply because someone, even everyone, deems it worthy of inclusion, would be a mistake. However, this is what is done all the time in our industry. We develop a process and then adjust, amend and contort it in the moment to accommodate the latest unemployment data, the most recent central banker quote selected by news sources and whatever else happens to make its way into our line of sight. Without even recognizing it, we undermine the process, converting it into an inconsistent mess, all while rationalizing our irrational behavior. That is what happened to the conference organizer. He was swayed by the latest polls, and mocked the prognosticator who had done his research and developed a model backed by data-driven evidence. Without even realizing it, it was the conference organizer who was exhibiting cognitive bias, *he* was making the mistake, but most importantly, he had no idea it was happening.

My response at the time was, "I have some real sympathy for his argument. His model is based on certain factors, what he defines as 'signal.'

Everything after the primaries is effectively 'noise,' according to his model. There is no reason for him to make adjustments, regardless of how wrong it may *feel* in the moment. The historical returns on the model, which is designed to ignore this updated data, are very good. If the model doesn't make sense now, then it didn't make sense when everyone was first quoting it. If they didn't call it out as nonsense back then, they shouldn't be calling questioning it now. Those who are, are the ones exhibiting cognitive bias."

Ready, Fire, Aim

On LinkedIn, I posted the Monty Hall Problem. The post reads:

> The host begins by unveiling 3 numbered doors & explains that behind one of the doors is a brand new car, while the other 2 each contain a goat. The contestant selects a door gets to keep whatever is behind it. After the initial selection is made, the host opens 1 of the remaining doors to reveal 1 of the goats. The contestant may then change their selection.
> Q: Should the contestant switch to the other unopened door?
> A: Although most people intuitively and confidently answer, "it doesn't make a difference," the only rational answer is, YES!

This response came from a Harvard MBA with more than 30 years of experience in finance:

> This "analysis" is total BS. The host knows where the two goats and the car are. No matter which door the contestant picks, the host will reveal a goat behind an unpicked door. At this point – which is when the contestant makes the switch/no switch decision – one unopened door has a car and one a goat. There is an equal probability of the car being behind either door and the contestant has a 50% chance of winning by staying with his original pick and a 50% chance of winning by changing. There is no advantage (or disadvantage) to changing picks. This isn't foolish intuition, it's REAL decision science. You should refund your fees if you are charging clients for the nonsense presented here.

In other words, a smart, highly educated, experienced and successful person had not only made a mistake, he was absolutely certain his logic was correct. His intuition was so powerful, not only didn't he hesitate to correct me, he chose to publicly chastise me as well.

I shared his response with my students because it serves as powerful evidence of the "unconscious" aspect of cognitive bias. We just don't know it's happening to us. My students seemed more excited to read my response, though. "Oh I bet you ripped him to shreds, didn't you?" one student said out loud. I did not. The reason is, every one of us makes mistakes like this all the time, and we are equally unaware and equally confident in our intuition. (As you recall, it's a lesson my mother-in-law taught me years earlier.)

I responded:

> You're not the first to vehemently oppose the solution. When the problem and solution were first published (back in 1975 not by me) it created quite the stir among some of the best minds in mathematics. In the end, those who initially argued your conclusion came around when they realized the flaw in their argument. I understand your frustration. It's the nature of dealing with cognitive bias. It's almost impossible to see it in ourselves, particularly when our intuition is so incredibly convinced it is correct, which is clearly the case for you here. And understandably so.

To which he responded:

> I looked into this further and I am wrong. It was NOT my intuition; it was an error in my analysis. What I missed is that there is POSSIBLE new information in the door selected by the host. When the host selects a goat door to reveal, it may be the case that he must select that door because the car is behind the other door. Switching improves your chances of being right because you leverage this possible new information. Not to shoot the messenger, but I think if you explained the problem the way I just did it would persuade more non-STEM types that you are correct!

I give him credit for taking a moment to look into it further (even if it did come *after* his initial comment). However, he missed the point. It is not my job to properly frame the information for him. In the real world, *you* are responsible for taking in data, commentary, and every other form of information, and then processing that information in a way that delivers an accurate representation of the world. Unfortunately, that information is often framed in a manner that is purposely designed to trigger cognitive bias. It is actually meant to trigger an emotional response or to lower your defenses. In the preceding case, I provided all the information necessary to properly solve the problem. To blame me for his error is like blaming the newscaster or the analyst for our inability to properly assess the macro environment.

Another person chimed in as well:

> It can be made clear even to the intuition if you increase the number of doors (and hence the information gained from the host's choice).
> So if there are 100 doors and you pick door 23, then the host opens all other doors except 23 and 96, it should be clear intuitively that it is more likely to be behind door 96 than 23.

He too may be correct, but it's important to understand that what appeals to one person's intuition doesn't necessarily appeal to everyone's. The better we understand how we intuitively approach problems based on our history and education, and the more we challenge that intuition to see beyond what automatically comes to our mind, the further we can expand the "box" within which we make all decisions. My goal in sharing the problem was not to teach someone how to solve this one problem, but to show that we are all vulnerable to decision-making mistakes, even smart, educated people and even on relatively simple problems. In order to improve our decision-making skills, this must not only be understood conceptually but also experienced first hand. Only then can a decision-maker experience a leap forward in the evolution of their decision making. In other words, only after you realize that it doesn't matter how many books you read on cognitive bias or how many biases and

heuristics you can name off the top of your head, you will still be vulnerable to these types of mistakes. Only then can real progress be achieved.

The Importance of Identifying What Is Beyond Your Control

In normative decision-making, after the outcome is properly defined, the decision-maker must identify the factors that influence the outcome, but which they do not control. In decision theory, these factors are known as *states,* but in the business of investing, we call them *signals*. Regardless of what term we use to describe them, this step may be the most important part of the decision-making process for investors. It also happens to be the step that is most often glossed over. The combination of it being so vital to the investment process while being so commonly overlooked or summarily dealt with by investors is why the machines are targeting it, and if you want to create a distinct competitive edge, so should you.

Problems most often occur when the distinction between noise and signal is made on gut feel and intuition rather than on data and evidence. When noise is mischaracterized as signal it increases the probability that we will not dig deep enough to find the factors that actually matter, and by that I mean, the ones that offer predictive value. When we are watching the wrong factors, the ones that don't offer predictive value, it creates confusion and uncertainty. Things feel like they don't make sense. More often than not though, the world does makes sense, it's just that we haven't properly framed it. The narrative is flawed. Let's explore this concept with a few examples from the real world.

The Real Reason Commodities Collapsed

> *The key to good decision making is not knowledge. It is understanding. We are swimming in the former. We are desperately lacking in the latter.*
>
> —*Malcolm Gladwell,* Blink

Since 2011, I have been writing and trading my view that the trigger behind the spike in commodity prices that began early this millennium

had reversed, and would result not just in a return to the old ranges, but also likely to the lower end of them, and probably for an extended period.

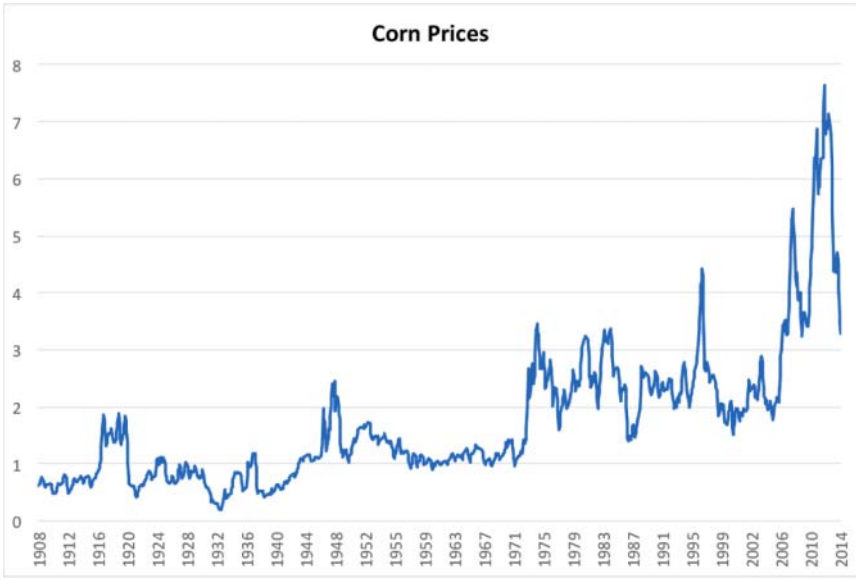
Let's begin by looking at the selection of long-term charts shown in Figure 17.1.

No matter which commodity chart you choose, they all look very similar. Each exhibits extended periods in which a clearly defined range held, until something happened around the millennium. If we are going to discuss where commodities are headed from here it would be absurd to do so without first addressing what it was that caused them all to *simultaneously* break out to the upside. In other words, we must identify the key factor(s) that caused the explosive outcome. If we can define those states, and they remain in place, then the odds of reverting to the old, long-run mean are small. However, if those states have reverted back, then it's very likely prices will too.

Back in 2002, China was *suddenly* becoming the most talked about topic among investors, pundits, and politicians. What I couldn't figure out was why. So I asked. Almost unanimously, the answer I heard was, "They have two billion people." Not only was the response factually incorrect (it was closer to 1.2 billion), it also didn't make sense. With a population growth rate of just 0.65% per year, in 2002, China's population represented 19% of the world total. That was down 14% since the institution of the One-Child Policy. Based solely on overall population, China actually mattered less than it had at any other time in modern history, so that could not explain why everyone was suddenly talking about it. If I could understand what factors caused us to talk about it, it might shed some light on why it might affect supply, demand, and market pricing, not to mention future growth and policy action.

What Happened and Why It Was So Powerful

In 1996, without any warning or global policy debate, and certainly void of any fanfare, China began orchestrating the biggest urbanization project in the history of mankind. In 1996, they moved 22 million people from rural to urban areas. To put that in perspective, 22 million is more



(a)

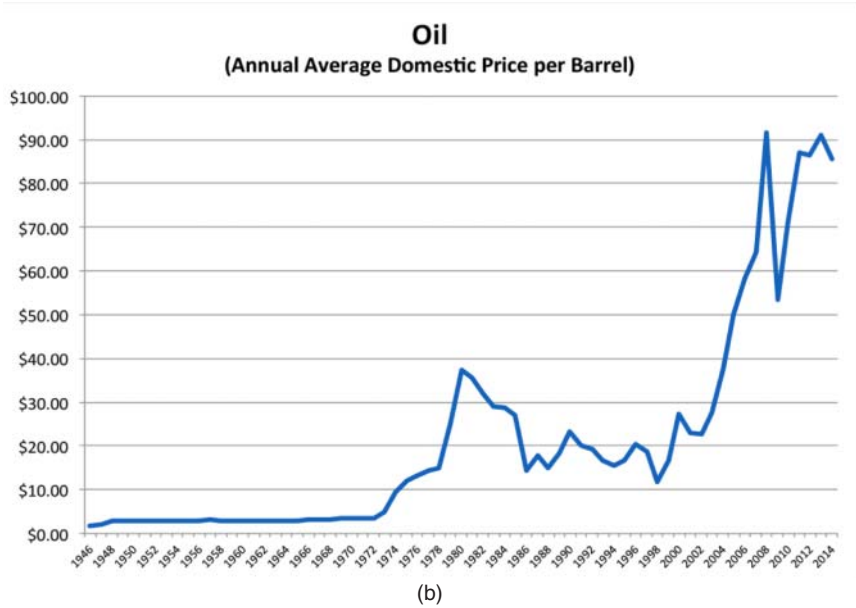


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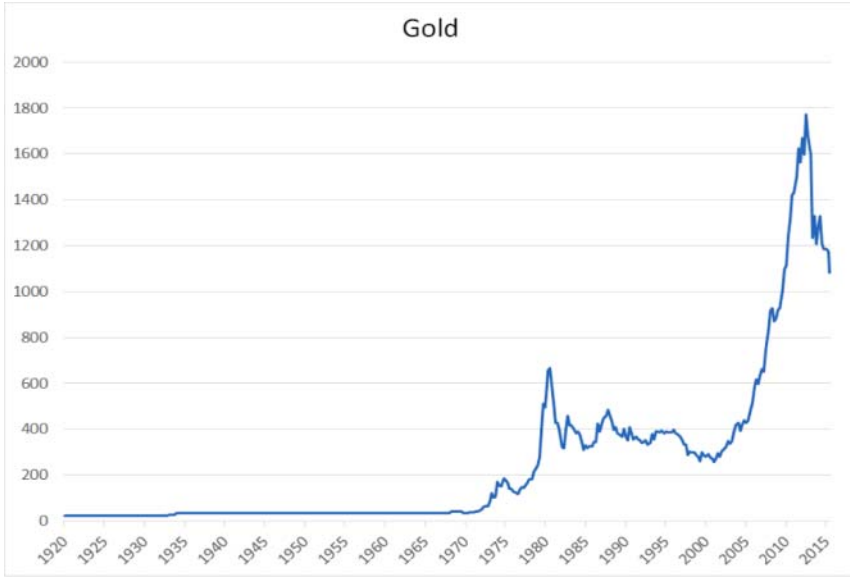
Figure 17.1 Long-term commodity charts



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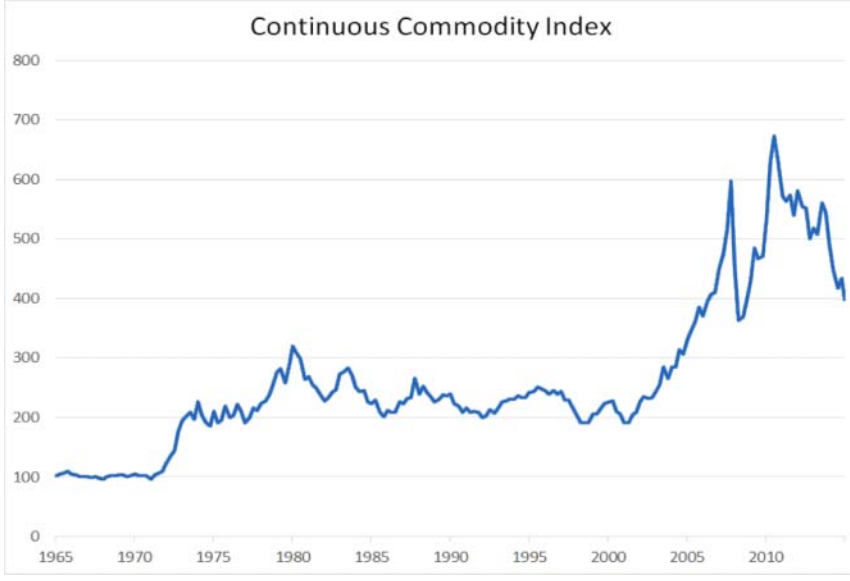

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Figure 17.1 (*Continued*)

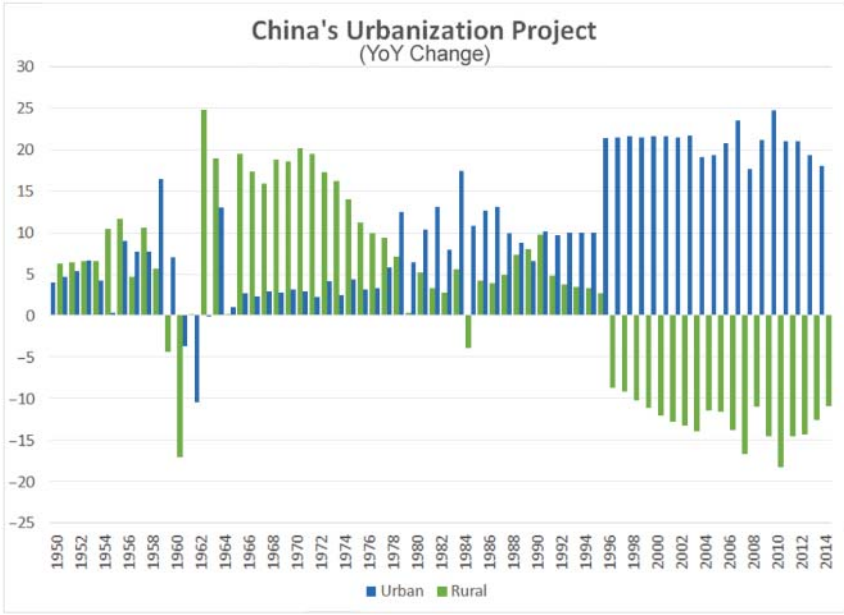

Figure 17.2 China's urbanization project

than the entire population of Manhattan, London, Paris, Sydney, Berlin, and Stockholm *combined*. Now, imagine all those cities being empty at the beginning of a year, then completely full by the end. That's essentially what began happening in 1996, and has continued unabated *every year* since (Figure 17.2). How is it comparable? Well, the urbanization of a country like China is like population growth on steroids. In essence, people go from being economically invisible to the rest of the world, to suddenly competing for jobs, raw materials, and food on a global scale. The fact is, city dwellers live dramatically different than their rural counterparts, particularly those from rural China.

They live in smaller groups, use four times more electricity, earn more money, and have greater expenses. They even eat differently, consuming far more sugary foods, more meat, and, importantly, they no longer produce it themselves (Figure 17.3). (Fun Fact: Cows are seven times less efficient at converting corn into calories than people are. That means when someone stops eating corn and instead chooses to consume beef, they actually create seven times more demand for corn.) Urban Chinese also have far more disposable income (Figure 17.4).

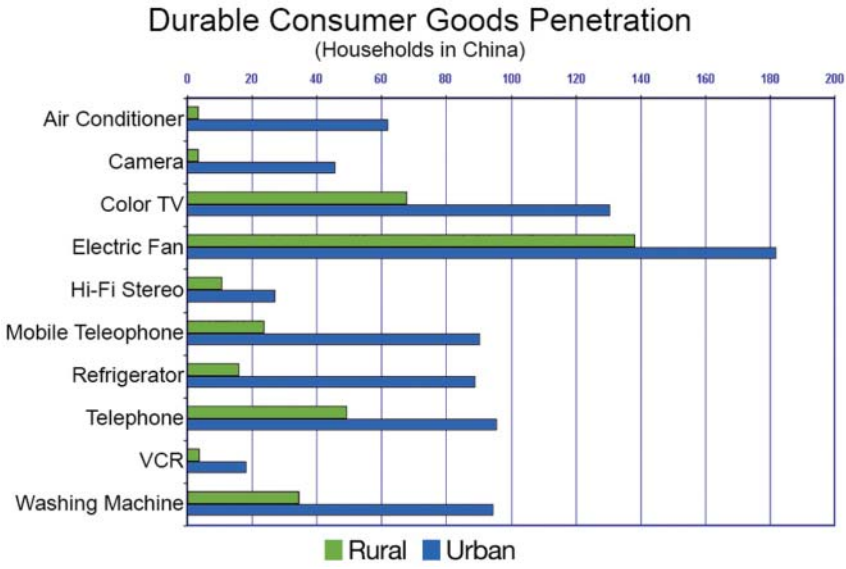

Figure 17.3 Durable consumer goods penetration in China

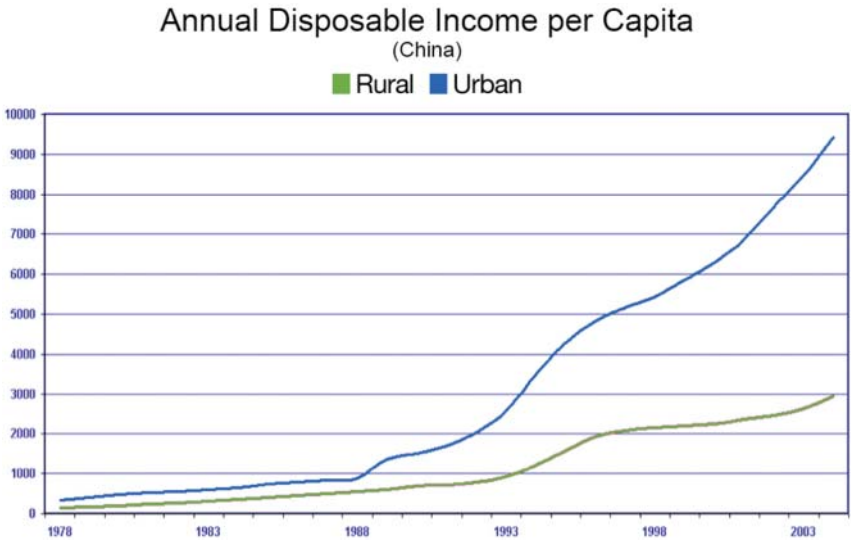

Figure 17.4 Annual disposable income per capita in China

Urbanization of this magnitude, and the industrialization that accompanies it, leads to a spike in demand for raw materials and food. It always has. Think America, England, Rome, Greece, Egypt. The difference this time around is that the demand wasn't satisfied through colonization and theft. This time, those who produce what was in demand – namely the tropical emerging markets, were paid fair value for what the world needed. As a direct result, it was the first time in history they had the opportunity to become as wealthy as their temperate counterparts. (The temperate emerging markets were simultaneously hampered because their competitive edge, primarily cheap labor, was facing serious competition from China's outsized supply of the same.)

However, even when talking about a country as massive as China, urbanization has a finite life. In 1996, 30% of China's 1.2 billion citizens were urbanites. Meanwhile, almost every developed nation was and is 85% urbanized. When economists finally picked up on what was happening, China had reached as high as 50%, which means another 540 million people would still need to come online before they too hit that magic 85% level. Therefore, these economists and analysts came to the conclusion that commodity prices would not only remain high, they would probably continue rising.

They Were Wrong for Two Reasons

The first flaw in their assessment is that in order to bring people online, someone has to pay for it. The incredible expansion of credit fueled by the combination of low interest rates, financial innovation, and irrational exuberance funded it for many years, but it couldn't go on forever.

The second fly in the ointment was, well, math. When you consistently increase the denominator (total urban population) by adding 22 million to it each year, each additional 22 million will have a gradually declining effect on the year-on-year growth rate (Figure 17.5b). Figure 17.5a, however, shows that although the Chinese authorities did what they could to prop things up during the crisis, the notional increase has also begun slowing from the steady pace of 22 million per year to 18 million in 2014. So, in this case, the numerator has also been getting

Figure 17.5 China's urban population

smaller, and the result is that the growth rate fell to pre-orchestration levels just as the crisis hit (by pure coincidence), and after the brief propping up by the powers that be, is now well below it, and going lower.

Who cares, right? I mean, they're still urbanizing 18 million every year and another 500 million plus are waiting in the wings.

Well, as it is with almost everything, it isn't the notional increase in population that matters, it's the year-on-year growth rate. Take a look at Figure 17.6, charts from England in the 1800s showing the relationship between notional population growth and prices, and the population growth rate and prices, to see what I mean.

That's why it doesn't really matter that China is only 50% urbanized and that another 540 million are waiting in the wings to come online. Both flaws have become exposed.

That's the bad news for commodities, but it is actually far, far worse than demand growth simply receding back to long-run averages.

Although everyone knows demand can affect commodity prices, the power of the demand side is almost always discounted, particularly

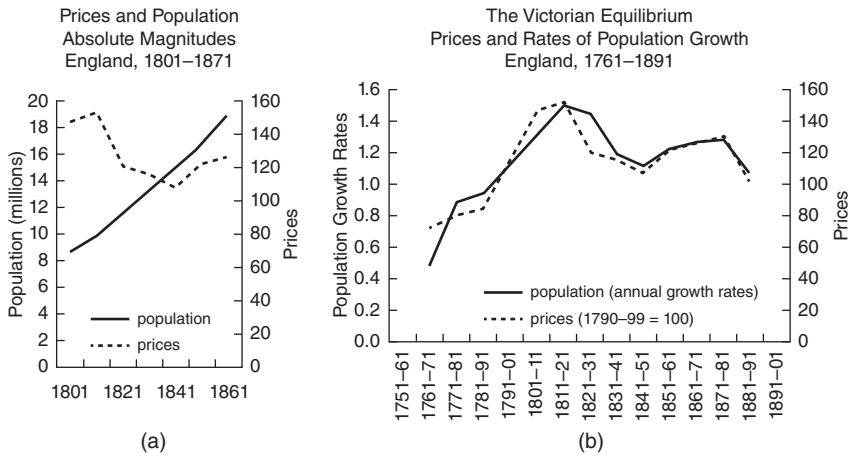

Figure 17.6 Price and population in Victorian England

by the commodity experts. There's good reason for that too. Demand shocks don't tend to last very long, which is why producers were so slow to respond to the spike in demand this time around. However, when it became clear that higher prices were here to stay (or at least it seemed that way), the supply side kicked into high gear on a number of very impactful fronts.

It began by drawing down on stock. Then the spigots were opened, which sparked concern that demand would soon overwhelm even potential supply. (Remember all those peak oil papers?) Well, although many think tanks and even practitioners think these things occur in a vacuum, they do not. When projections of radical shortfalls gain traction, opportunists rush in to capitalize on the void that is predicted to develop. With oil over $60, then $80, and even $100, the money for exploration poured in and the peak oil theory quickly petered out, even if its proponents still aren't willing to admit it (Figure 17.7).

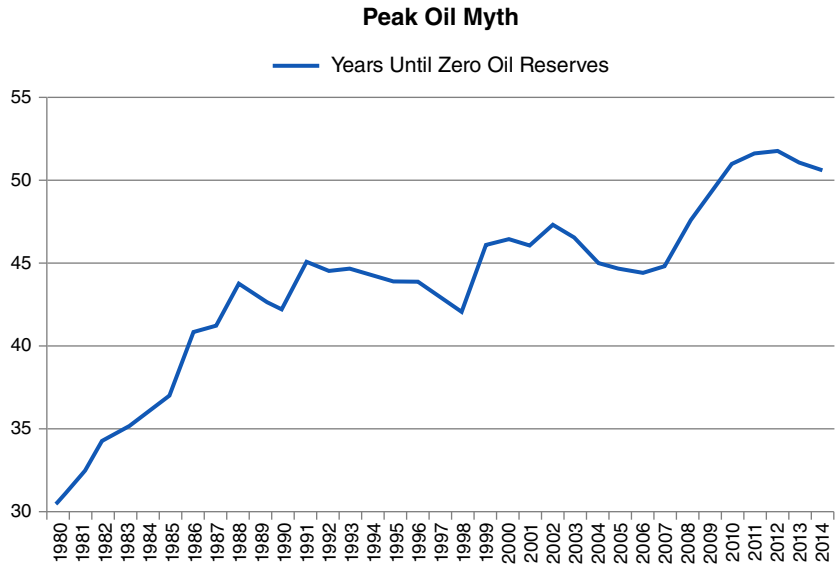

Figure 17.7 Peak oil

Investment also went toward devising ways to reduce future demand. As the price of gasoline spiked, consumers shifted away from their SUV monstrosities toward more fuel-efficient alternatives like the Prius and Tesla. Manufacturers responded and fuel efficiency has spiked over this period.

However, the real impact has yet to be truly realized. What Figure 17.8 shows is the average miles per gallon achieved by models released in a given year. It ignores the fact that not every car on the road is brand new. In the United States, the average lightweight vehicle is 11 years old. So, the average mpg for cars on American roads is something more akin to the chart on the right. Meaning, demand is only now about to show the true impact of the efficiency gains we've achieved over the past decade.

Fuel efficiency of the cars on our roads hardly scratches the surface of what has been gained since the commodity boom began. GMOs, mining technologies, newly discovered oil reserves, and the technology that made it possible – wind, solar, and Tesla's new batteries – are but a few of the many improvements already made on the supply side, with many more sure to follow, which will continue putting downward pressure on commodity prices. Add to that concerns over global warming and other environmental drivers pushing for greater efficiency, recycling and upcycling, and you have additional downward pressure coming from the demand side of the equation, possibly for generations to come.

The bottom line is this. Without the orchestration of the biggest urbanization project in the history of mankind, commodities would not have exploded out of their long run ranges. With the impact of that event having run its course, you could argue that we should simply go back to the well-worn ranges that preceded the boom. However, even though the direct impact of urbanization is now over, the aftershock of its secondary effects will remain with us for a long time to come.

As a result, I expect commodity markets to continue performing similarly to how they did in previous periods of urbanization of this magnitude. In other words, lower for longer.

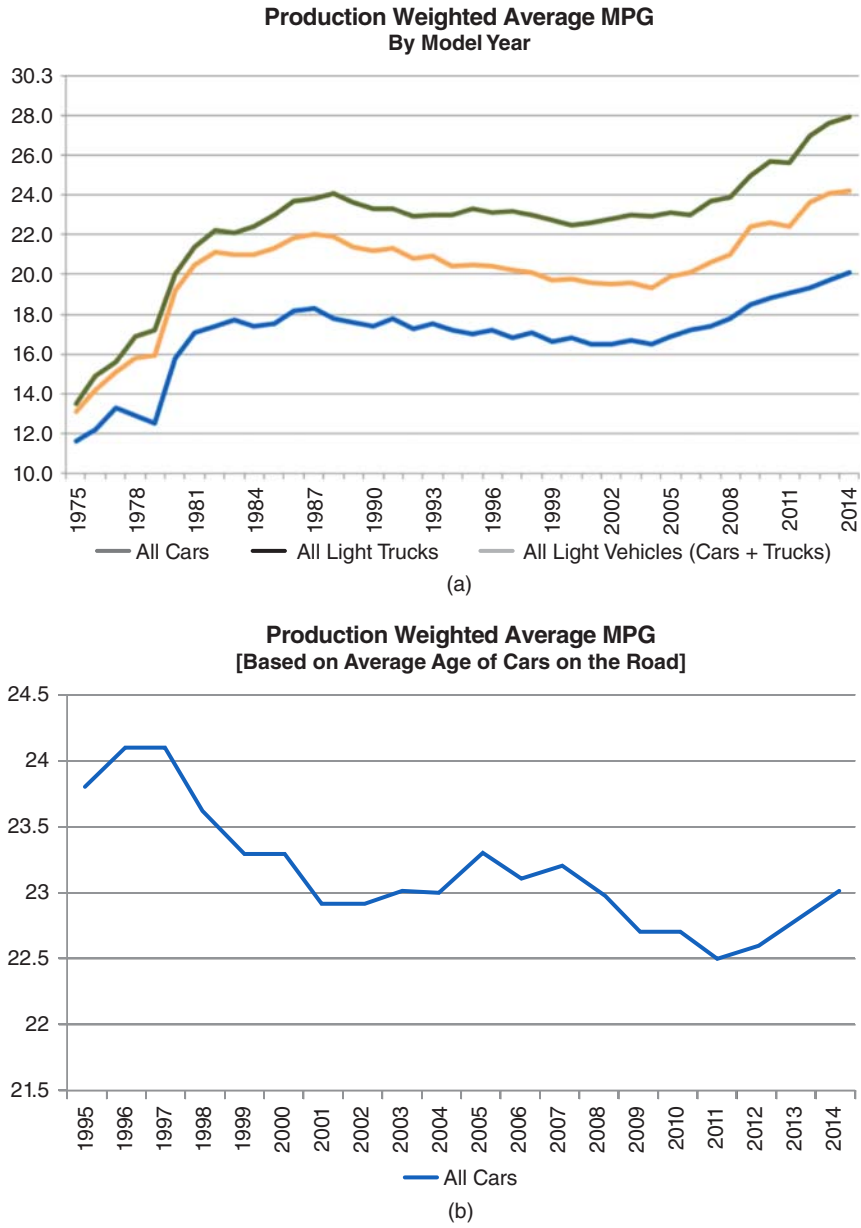

Figure 17.8 Production-weighted average miles per gallon

Slower Is Faster

Every once in a while someone will question whether my investment process isn't too confining. There is no doubt that limiting us to trades that have a self-liquidating feature (i.e. defined downside), requiring that we adhere to predefined take profits, having to take the time to pre-script trades, and sticking strictly to only the most liquid markets and instruments, curtails our opportunity set. The question is whether it is too restrictive.

If you distill the job of an investor down to its essence, it is to predict the future. No matter how artificial our intelligence or learned our machines become, predicting the future will always involve uncertainty. Our objective then is to improve our predictive abilities, to nudge the odds of a successful prediction in our favor. As it relates to the restrictive decision-making process prescribed in this book, the idea is rather simple. The opportunity set that remains when these restrictions are in place is somewhat positively skewed. That means, all else being equal, including the portfolio manager's skills and the market environment, the odds of putting on a winning trade are slightly better than that of a losing trade. Conversely, the odds, when selecting from outside the restricted zone, are negatively skewed. It's important to acknowledge up front then that there will be trades that make it through the barriers yet won't be profitable. Conversely, there will be some winning trades that won't pass muster. In other words, they will be *right* but not *rational*.

Try this analogy, from Mark Buchanan's *The Social Atom*:

> A crowd rushing to the exit piles up in a traffic jam, whereas people avoid the jam and get out if they move more slowly. As Helbing puts it, "Slower is faster." But now for a bigger surprise. A room might obviously have some tables in it. How would their placement and size affect the escape of a crowd? It seems obvious that obstacles have to make the situation even worse. Yet, counterintuitively, they can be quite beneficial. In particular, a table placed a few feet in front of the exit can help regulate the human flow. The table changes the pattern of self-organization, helping everyone get out more quickly.

The self-imposed restrictions embedded in the investment process prescribed in *AlphaBrain* are very similar in nature to the tables strategically placed in front of the exits in Buchanan's experiment. For those who are impulsively inclined, obstacles of any kind can feel confining, even dangerous at times. Once again, Phil Jackson (the highly successful long time NBA coach) offers some relevant words of wisdom. "Inevitably, paradoxically, the acceptance of boundaries and limits is the gateway to freedom."

Everyone is vulnerable to cognitive bias and heuristics. Some may be intuitively better at avoiding some forms or others, but no one is immune. There is no magic bullet to decision-making, no matter how badly people want one. The keys are incremental improvement and fewer mistakes – two skills that can be built with time, awareness, and practice. It sounds simple. In fact, it *is* simple. But it's also incredibly difficult. This is an individual process, and it takes real self-analysis, grounded in data. At its core improved decision-making comes from a normative decision-making process, one that is planned ahead of time with minimal influence from emotion and cognitive bias. The difficulty comes from the discipline required to follow through with that plan. The art of decision-making comes when you practice discipline but resist the urge to be dogmatic and inflexible.

This doesn't mean you should allow yourself to become reactionary. In order to thrive we create as beneficial an environment as possible, and then invite cognitive strain. This approach is diametrically opposed to reacting in the moment while experiencing cognitive stress.

Be clear in your goal and in what you cannot sensibly change. Accept your states; do not deny them or try to change them. Dig through noise, emotion, and distraction to focus on what matters and why. Consider that external forces can apply pressure as well. Many industry-wide standards of risk management are not helpful to good investing, and many firms are set up poorly. These, too, are states that you must manage and adjust to.

As investors, our task is clear-cut: Create a trading plan in advance and do not deviate from it, without very good cause. Write it down. Clearly include your rationale, states that impact your trading, your stop loss, your take profit, your size-up and size-down reassessment

triggers. Write down other triggers that would challenge your rationale. Most important, write down what your exit was and do a postmortem on the reasons that led you there so you can apply what you learn to the next trade.

The world around us is set up to use our cognitive biases against us, but developing a decision-making process based on increased awareness can help us find our way to profitable trades or a clearer everyday experience.