

"Playing catch up" injects undesirable emotions and motivations into decision processes. For reasons related to the way our human brains are wired, being in this position will introduce biases. We should be particularly aware of the effects of these biases on financial decisions – they relate to many of the classic pitfalls known in the behavioral finance research literature.

THE RISK TO PLAYING CATCH UP

THE CASE OF TENERIFE

The most deadly accident in aviation history is a surprising one, particularly because of its pilot.

the company's expert on 747s. He was even featured front and center in KLM's advertising campaign touting their reliability. Following



A simulation of the Tenerife disaster

Captain Veldhuyzen van Zanten was probably the most distinguished pilot at KLM. He was KLM's Chief Flying Instructor and regarded as

the crash, officials from the airline put him forward to be the airline's investigator of the incident, before realizing that he was, in fact,

the pilot involved. Nonetheless, on the 27th of March, 1977, his decisions resulted in the deaths of 583 people. Why?ⁱ

Ominously, KLM's advertisement featuring van Zanten contains the headline, "KLM. From the people who made punctuality possible." It was the concern about punctuality that probably led to his undoing on that fateful day. To begin with, the KLM flight was never meant to be in Tenerife. A minor terrorist attack at its Gran Canaria Airport destination had forced the flight from New York JFK to be diverted and make a landing at the small airport in Tenerife, another of the Canary Islands. Other flights with the same destination had to do the same. Tenerife was not prepared for this kind of traffic and, to make matters worse, very dense fog started accumulating at the same time. But maybe the biggest problem on van Zanten's mind was the mandatory rest period for pilots. Being grounded for more than about 5 hours would have pushed him into the mandated rest period. Taking off after that would not simply have been a breach of airline policy, it would have been punishable with jail time in the Netherlands, according to a recently passed law. At the same time, getting delayed in Tenerife would not just have been a letdown to KLM's taglines stating their punctuality. There was no replacement crew in Tenerife, so the flight would have been stranded for an entire day and night on the wrong island. There were likely not available hotel rooms on Tenerife to accommodate the hundreds of passengers. And having their plane offline for a day would have caused a cascade of flight cancellations throughout the KLM system. Staying in Tenerife would have been a nightmare for countless thousands of KLM passengers.

So, van Zanten and his crew on KLM Flight 4805 were in a position of "playing catch up" and started making decisions differently. Van Zanten decided to do an unscheduled refueling, in order to save time on the turnaround down the line when he arrived late at Gran Canaria. But doing so meant that he missed a spontaneous opening to take off, and dense fog engulfed the runway as they waited. The frustration only mounted. Meanwhile, the understaffed air traffic control at Tenerife seemed to be in no hurry at all. Van Zanten got approval for his flight plan, taxied the runway, and revved his engines. The fog was so thick that air traffic control could not even see his plane at the end of the runway. Van Zanten's copilot, who had been certified by Van Zanten himself only months before, said, "Wait a minute. We don't have ATC clearance." Van Zanten hit the brakes and said, "I know that. Go ahead and ask." The communications that followed were apparently confusing. There was some radio interference and both parties, the KLM crew and the Tenerife control tower, used some non-standard terms. Somehow after that, van Zanten decided to charge ahead down the foggy runway. Unbeknownst to him, Pan Am Flight 1736 was parked half-way down the same runway.

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By the time the two pilots saw each other, at less than 300 meters, it was too late.

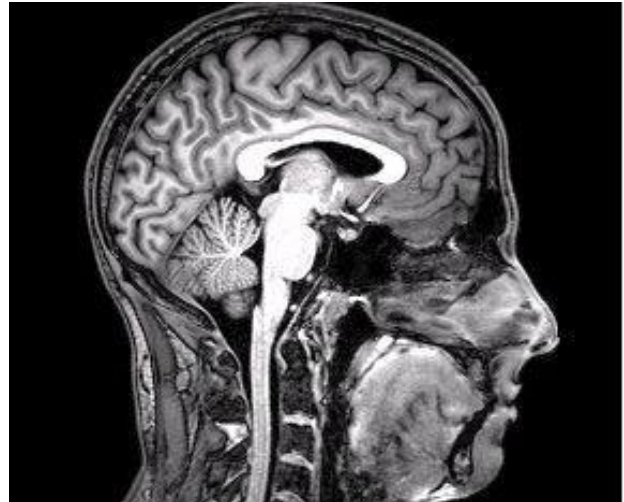
The Pan Am pilot tried to drive into the grass. Van Zanten tried to pull up hard, but the extra 40 tons of fuel he had just taken on weighed him down. His tail dragged on the runway and his landing gear and engines ripped through the top of the Pan Am plane. His plane collapsed in a fireball 500 feet down the runway, killing all 234 passengers and 14 crew members. The impact and fire on the Pan Am flight killed 326 of its passengers and 9 of its crew.

HOW OUR BRAINS ARE WIRED

What was the effect of being in a position of playing catch up? It injected undesirable emotions and motivations into the decision making process. When we play catch up we feel anger and irritation, we feel pressure, and we often feel oddly overconfident. Each of these emotions and beliefs leads us to taking more risk, risks that are often unwise and ill-considered.

This admonition is millennia old. In Aesop's Fable, the Tortoise and the Hare, the hare is famously overconfident and takes a nap midway through the race, putting himself in a position to play catch up. By the time he realizes he is behind, his anger and frustration only backfire and he is unable to win the race. As the Bible tells us in Ecclesiastes, "the race is not to the swift".

Why do we make these cognitive mistakes when we are under pressure to catch up? The answer may lie in the way we are biologically wired. Humans have the most advanced brain of any creature on the planet, but it evolved from a much simpler base. At the core of our brains is a structure called the limbic system, which we share with even our most primitive ancestors, like lizards and rodents. This primordial part of our brain



An image of an fMRI scan of a human brain

starts to take over in many emotionally charged and high anxiety situations. Neuroscientists call this "preferential engagement" of our limbic system, and it is a well-adapted response. Our ancestral brain anatomy serves us well in the behaviors of basic survival. It is good for impulsive decision making in the wild. But it does not necessarily serve us well when making complex decisions in our modern society; for example, flying airplanes or managing financial assets.

In fact, neuroscientific research has provided evidence that the most well established findings of behavioral finance may result from preferential engagement of our limbic system. One example is the finding that overuse of our limbic system is responsible for "hyperbolic discounting", a phenomenon wherein people exhibit unnaturally high discount rates when making short-term decisions, and often unnaturally low discount rates when making long-term ones. To see hyperbolic discounting in action, imagine someone offering you a thick envelope of \$10,000 in cash. Suppose that before taking the money you are asked what amount of money you would need to receive

to be persuaded to take a check in two weeks instead of cash right now. Common answers of the 'person on the street' are often an additional \$100 - \$1000 dollars. That is, many people will purportedly require annualized interest rates in the hundreds or even thousands to defer an immediate payment for a relatively short period of time. Consider, alternatively, the offer to receive \$10,000 on April 15, 2027. Before accepting, you are asked how much you would require to receive the funds on April 30, 2027 instead. In this case, the 'person on the street' often expresses near indifference between these two dates, which are also two weeks apart, and is willing to take about \$10,000 on either date, reflecting a near zero interest rate. The mismatch between these two results is called "hyperbolic discounting". Research using fMRI brain scans of people making financial decisions has given evidence that we are disproportionately using our limbic system brain regions when making short-term decisions, and that this may be responsible for the abnormally high discount rates often exhibited when people think short-term.ⁱⁱ

Discounting is, at its core, the price we put on having to be patient. If we forego spending our money now, we ask for compensation for the opportunity cost of not using our capital ourselves right now. As we get more patient, we tolerate lower discount rates. That is, we pay a higher price, a lower markdown, on money to be paid to us in the future. Greater impatience will result in wanting higher returns. What is the effect of reaching for these higher returns? We take the risks that are often required to get these returns, but they are often the wrong risks and not well deliberated.

Not All Risks Are Perceived the Same

If Captain van Zanten's impatience played a role in the Tenerife disaster it was via risk taking and risk perception. Impatience causes a greater willingness to take risks, but it also influences risk perception. The emotions that impatience brings about, like anger, have been shown in research to cause us to perceive negative events as predictable, under human control, and brought about by others. That is, by being impatient or angry, we are not only more willing to take risks, we are also more likely to underestimate them. Consider the results of a study conducted by Jennifer Lerner, a psychologist at Harvard's Kennedy School of Government, in the wake of the 9/11 attacks. In her study, Americans read one of two news stories. Some read a story about the threat of anthrax attacks; a stimulus intended to elicit fear. Others read a story about celebrations of the attacks in Arab countries; a stimulus designed to elicit anger. Those who read the story about more terror attacks perceived greater risk in the world and perceived negative events as unpredictable and subject to outcomes beyond control. Those who were made to feel angry, though, had a different reaction to risk. They perceived lower risk in the world, even for events unrelated to terrorism. They perceived negative events as predictable, under human

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control, and brought about by others. Consequently, they also supported harder policies against suspected terrorists than did participants who were primed with fear.ⁱⁱⁱ

THE TRAGEDY OF OVERCONFIDENCE

A low discount rate is not the only byproduct of the emotions we get from playing catch up. Consider a little known fact: research on retail investors demonstrates that there is one basic demographic attribute linked to significant outperformance. Women outperform men by almost a percentage point per year. Why? Are they better stock pickers? Do they bias towards the right types of mutual funds? Unfortunately not. Women just are not as overconfident as men when making their investments and consequently do not trade as much. In a paper by economists Brad Barber and Terrance Odean titled, "Boys Will Be Boys", they found that across 35,000 Paine Webber brokerage accounts, women outperformed men by almost a full percentage point per year by simply not trading as much. On average, the men traded 45% more than the women. When men did not have a woman in their household, perhaps to mitigate their decisions or counterbalance their overconfidence, they did even worse. Single men traded 67% more than single women, and thereby reduced their returns by 1.44% per year, comparatively. Overconfidence seems to be the undoing. According to surveys from Gallup, men also expect to outperform the market by almost a percentage point more than women do. (Though, on average, both men and women report an expectation that they'll beat the market.)^{iv} Again, one of the pitfalls of playing catch up is that, ironically, we are often overconfident when we are behind; ready to

charge down foggy runways. If impatience and playing catch up causes us to believe events are more controllable and have more confidence in our ability to manage risks, this is just as dangerous to our financial decisions as paying high prices by accepting an excessively low discount rate.

SHORT-TERM VERSUS LONG-TERM

Neuroscientists find that when we make discounting choices about the more distant future, we disproportionately use the most human parts of our brains^v; the parts at the front of our brains, behind our foreheads, that were the last to show up in evolution. Decisions that involve planning well into the future appear to particularly utilize regions like the orbitofrontal cortex, a brain region that is massively larger in humans, and located right behind our eyeballs. Alternatively, short-term and emotional decisions generate lots of amygdala activity; a



The Hare is publicly surprised by the Tortoise

central part of the limbic system, located above the back of the mouth. It is interesting that this parallels the findings on overconfidence, as well. Neuropsychologists find that when people have more orbitofrontal cortex activity, they make more accurate judgments, they are more self-reflective, and they exhibit less overconfidence.^{vi} Thus, when we are thinking short-term, not appealing to our better instincts, we may be biologically prone to various biases, like hyperbolic discounting and overconfidence, because both involve underutilization of the more advanced decision making machinery of our brains. By thinking in a primitive way, we get discounting for the future wrong, while also being overconfident about risks and our own decision making abilities.

THE DARK SIDE TO THE MATH OF COMPOUNDING

What is the moral of this story for our financial decision making? Like the tortoise, we should remember that “slow and steady wins the race”. But what exactly does that mean? What are the investing pitfalls that put us in a position to play catch up?

First, we take too much risk. This is related to playing catch up for several reasons.

The nature of compounding returns is counterintuitive to many people. If you lose 20% on an investment, it is not 20% you have to make to get your money back – it is 25%. A 20% loss on a dollar leaves you with 80 cents. It takes a 25% gain on 80 cents to get to a dollar. This means that high volatility investments are more likely to put us in the position of playing catch up. A dramatic example of this can be seen in “leveraged” exchange traded funds (ETFs). Many such funds have the aim of producing two or three times the returns of a target index. They do

this primarily by using derivative products, like futures and swaps: contracts which derive their profit and loss from the index, but do not involve actual ownership of the stocks in the index. By entering into these contracts, the funds can gain more exposure to the price moves of the index than if they had to actually buy the stocks. This extra exposure earns them the term “leveraged”. So naturally, these leveraged funds hold positions two or three times the amount of capital they have in order to match their target return. But as the market moves, so does the value of the fund’s positions, and hence the fund’s capital, as well. Here is where the fund is in a bind. If they constantly rebalance their positions,

“There just simply is no way of getting around the unfortunate mathematics of playing catch up.”

scaling up and down every time the market moves, they will incur massive transaction costs, and grossly underperform their benchmark as a result. At the same time, if they do not rebalance when the market moves, they will be left with an incorrectly sized position for their amount of capital. For a fund that is long the market (i.e., it profits when the index rises), if the market moves up, the fund will no longer have enough market exposure for its newly increased capital base. Conversely, if the market drops, they will now have too much exposure for their decreased amount of capital. Some funds are dedicated short funds, creating a vehicle that tries to profit when the index drops. This might be particularly useful to investors who are

restricted from shorting because with these short or “bear” ETFs, they can buy a fund, but still hedge or even profit in a market downturn. But for these funds, when the market drops, they are never holding enough short exposure, and when the market moves up, against them, they holding on to too much short exposure. So, market volatility has these high risk products constantly playing catch up.

Consider the Direxion Daily S&P 500 Bear 3x Exchange Traded Fund (SPXS). Direxion Funds says that their product “seeks daily investment results, before fees and expenses, of 300% of the inverse (or opposite) of the performance of the S&P 500 Index.”^{vii} But daily investment results are very different from long-term results when you are constantly playing catch up. To see this, let us consider the most actively traded ETF for the S&P 500 index itself, the State Street “SPDR” fund with the ticker SPY. Its opening price for trading in 2015 was 206.38, on the morning of January 2nd. It closed the year on December 31st at 203.87 and paid \$4.206 per share in dividends over the year. Therefore, an investor short SPY would have been down 0.82%, before the cost of financing the

position (i.e., borrowing the shares), which might have cost another 0.5%. Therefore, we might expect a 3x short position to have been down around 4% for the year. Unfortunately, constantly playing catch up in a high volatility product took a much higher toll. SPXS opened the year at 20.37. It paid no dividends over the year and finished at 16.92 on December 31st, down 17%. It is not that Direxion has a poorly managed product either. They are specialists in leveraged ETF products and offer more than 100 of them. There just simply is no way of getting around the unfortunate mathematics of playing catch up.

PEOPLE FOCUS ON THE WRONG RISKS

We are vulnerable to other miscalculations about risk, too. One of the most problematic can be that we do not perceive all risks in the same way. Psychologists like Paul Slovic have revealed that we underappreciate some risks.^{viii} Those that are familiar, subject to our own control, and do not invoke dread are all too tolerable to us. Think of the everyday risks that claim thousands of lives for which many people neglect even basic and low-cost precautions that would save lives: home swimming pools and bicycles, for example. On the other hand, there are the risks at the opposite end of the spectrum, those we dread, cannot control, and feel very foreign to us. These are risks like terrorism and nuclear accidents. We are willing to devote vast resources to unproven measures for preventing even a single death from terrorism, and yet many of us forego even wearing a helmet while bike riding, a proven and simple way to prevent death and serious injuries. This misperception of risk created the famous “indirect death toll of 9/11”. Following the terrorists attacks of



Nuclear warnings really get our attention

September 11, 2001, US airline passenger traffic fell by as much as 20%. But Americans were not travelling less, they just opted to drive more. The risk of road accidents is not foreign or dreaded, and feels under our own control. Meanwhile, the risk of death in an airline hijacking or terrorist attack is very foreign, out of our control, and was the subject of intense dread by every American following the attacks. But this was a misestimation of the true risks. Driving is actually much more dangerous than flying on a commercial airliner. German risk expert, Gerd Gigerenzer, estimated that an extra 1,595 Americans died in car accidents, just in the year following the 9/11 attacks, as a result of the decisions to drive instead of fly. "People jump from the frying pan into the fire," he said. He attributes this to the "defensive" decision making that people make. "Politicians would be held responsible if a plane had crashed," he continues. "If people are killed because they are forced to take their car instead, they are not blamed."^{ix} We can see how van Zanten was focused on the wrong risks too, when waylaid at Tenerife, worried about the proximate small risks and what he could be blamed for. When we are playing catch up, we are all the more vulnerable to the "defensive" decision making that Gigerenzer warns us about: worrying about blame and misperceiving the greatest risks.

TAKING THE WRONG RISKS

This pitfall happens when we make financial decisions, too. In fact, some forms of risk can become more than comfortable; they can even become trendy. This happened with "liquidity risk" before the Credit Crisis of 2007 - 2009.



UK depositors queue outside in a bank run

Liquidity is the ability get one's money out of an investment. Lack of liquidity, and the potential for it, is a form of risk in investments. It is one of the core risks of finance and it underlies the banking system. The basic model of a bank is that it finances itself by taking deposits, like checking accounts, and uses this money to purchase or create assets at a higher yield. These assets, traditionally loans, are longer term and less liquid than the deposits. This mismatch, and the resulting difference in yield between loans and deposits, is what generates a profit margin for the banks. It is also what creates risk and instability for the banking system. If enough depositors choose to withdraw their money, a bank may not have the money on hand to return to the depositors. In this case, the bank may fire-sale its assets in order to generate cash, and other depositors may rush to the bank to try to get deposits out before they are all gone. These simultaneous actions generate feedback and the bank goes into a death spiral. This is a "bank run" and it is the process that unfolds in any banking and credit crisis.

The risks posed by illiquidity, credit crises, and bank runs are easy to miss, though.

They are not as salient to us, because they are seemingly not a problem at all, until they are a huge problem. Like backyard swimming pools, we are lulled by the benefits and ostensible security of our daily interaction with a stable banking system. Our willingness to accept no interest and even pay fees for checking accounts – for letting banks borrow our money to earn profits with – is built upon a premise of implicit trust. Yale financial economist Gary Gorton, a specialist in financial crises, describes the model of banks as matching “information insensitive debt” (deposits) against “information sensitive debt” (loans).^x That is, the banking system relies upon the belief that there are certain assets for which we are safe in overlooking and ignoring the risks; assets like our checking accounts. It is not simply a question of whether our deposits are truly safe at our bank. The moment we even have to investigate whether a seemingly risk-free asset is actually safe, that contract of implicit trust, the very premise of the product, is broken. The fact that the banking system relies upon this cognitive dissonance, a suspension of doubt, is reason enough for concern. But to make matters worse, any time there is a market for information-insensitive debt, there is also a parallel market for information-sensitive debt that is intimately linked – it is the other side of the balance sheet. The risk this creates was apparently easy for most of the world to miss before the Credit Crisis.

In 2001, America and the global economy were hit with simultaneous catastrophes. In 2000 the “Dot-Com Bubble” popped and, with it the stock market, many jobs, and much of the booming business activity of the years before, all collapsed. According to the National Bureau of Economic

Research, the United States began a recession in March 2001. Then, in September, the U.S. was hit with devastating terrorist attacks that sent shock waves through the global economy and financial markets. In response, the Federal Reserve slashed its target rate for Federal Funds Deposits to an all-time low for the time: 1 percent. While this consequently drove down interest rates for all loans, most notably mortgages, it also put any owners of loans and bonds in a position of playing catch up. Pensions, endowments, insurance companies, and banks all have business models that rely upon earning handsome yields from loans and bonds. The very same interest rates that made the American Dream possible for so many families also put many financial institutions in a squeeze. Part of the unfortunate response was to reach for yield and make up some gains by taking risks that were easy to ignore, especially liquidity risk. Consequently, a new booming industry formed around mimicking the liquidity transformation trick of banks on a much larger scale; taking information-sensitive debt and manufacturing assets that could be claimed to be information-insensitive. Through the process of securitization and gaining triple-A ratings from major ratings agencies, a massive market was created that enabled many investors to suspend doubt and not do research. Investors could seemingly earn the more attractive yields they needed in order to play catch up, without taking risk. Of course, this was too good to be true. It proved to be another classic pitfall of trying to play catch up, and hence not seeing risks, evaluating them properly, or understanding their potential magnitude. The financial institutions reaching for that relatively small yield enhancement were like Captain van Zanten on the runway worrying about saving

time on refueling and not being blamed for causing a cascade of flight delays.

LESSONS LEARNED

The good news is that we do not have to fall victim to our biases. By adopting a slow-and-steady low volatility investing strategy, we can prevent finding ourselves in a position of playing catch up. We can also be more cognizant of the risks we are taking. When our returns come from cognitive dissonance, believing that we can simultaneously earn returns that usually come with risks, while also suspending our doubts or the need to investigate, we will always be setting ourselves up for disaster. Having information and acting with caution is what prevents plane crashes, and it is what makes for savvy and prudent investing.

“We do not have to fall victim to our biases.”

What we learn from the tortoise is that need to know ourselves, be persistent, judicious and wide-eyed with the risks we take. More importantly, what we learn from the hare, is that we are vulnerable to bad choices when we are playing catch up. We will

never be able to stop the world from putting us in this position from time to time. But we can go forward understanding our human instincts when we find ourselves there.

Yet again, the global financial markets are in a position today where financial institutions are pressed to find the yield they need. The answer cannot be that institutions and investors flock to products in which they can suspend their doubts and pretend they are taking no risk. In so doing, they will surely only be ignoring the most important risks. At the same time, they must steadily compete in the race, taking risks judiciously and with due diligence. When pilots worry about not being blamed for the small immediate problems like delays, even the most experienced can go charging down foggy runways before getting all the information they need. When we fly planes or manage the assets of financial institutions, we can only act wisely if we engage the “executive functioning” of our frontal cortex and not rely on the primitive animal instincts that come along with thinking short-term. Our executive decision making does not make us run from all risk. It does, however, make us cognizant of our risk taking and, therefore, gather information – perform due diligence. When we think with our frontal cortex we think long-term. We think slow and steady. We think analytically. We do our research. In the long run, this will always be the way to win the race and act responsibly.

ⁱ See further: “ASN Accident Description”. Aviation Safety Network. <http://aviation-safety.net/> and [Air Disaster Vol. 1](#). Job. 1995. Aerospace Publications.

ⁱⁱ “Separate Neural Systems Value Immediate and Delayed Monetary Rewards.” McClure, et al. *Science*. Vol 306. 2004. pp. 503-507.

ⁱⁱⁱ “Emotion and Decision Making,” *Annual Review of Psychology*. Vol. 66. 2015. pp. 799-823.

^{iv} “Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment.” Barber & Odean. *The Quarterly Journal of Economics*. Vol. 116. No. 1. 2001. pp. 261 – 292.

^v “The Neural Correlates of Subjective Value During Intertemporal Choice.” Kable & Glimcher. *Nature Neuroscience*. Vol 10, No 12. 2007. pp. 1625 – 1633.

^{vi} “Roles of Medial Prefrontal Cortex and Orbitofrontal Cortex in Self-Evaluation.” Beer, et al. *Journal of Cognitive Neuroscience*. Vol. 22, No. 9. Sep, 2010. Pp. 108-119.

^{vii} Direxion Investments website: <http://www.direxioninvestments.com/products/direxion-daily-sp-500-bull-3x-etf>

^{viii} “Perception of Risk.” Slovic. *Science*. Vol. 236. 1987. pp. 280-285.

^{ix} “Out of the Frying Pan into the Fire: Behavioral Reactions to Terrorist Attacks.” Gigerenzer. *Risk Analysis*. Vol. 26, No. 2. 2006. pp. 347-351.

^x [Slapped by the Invisible Hand: The Panic of 2007](#). Gorton. 2010. Oxford University Press.