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# Tiptoe Through the Tulips

Nassim Taleb's latest work, *The Black Swan* demands a thorough reading as it will be a powerful force in shaping public perceptions of quantitative finance

When we left Nero Tulip last week, he was battling John the high-yield trader and Carlos the emerging markets wizard. Both have been vanquished, fooled by randomness. Now our hero is back with more exciting adventures. In *The Black Swan* he is joined by Yevgenia Nikolayevna Krasnova as the former girlfriend, Fat Tony as a like-minded trader and Dr. John, as the risk manager and straight man. There are real-life characters as well, including well-known quants such as Robert Engle, Robert Merton (both K. and C.), Steve Ross, Myron Scholes and Philippe Jorion, at least some of whom might have declined the invitation had they been asked.

For those readers unfamiliar with the series, it began with Nassim Taleb's first book, *Dynamic Hedging* in 1997. *Publishers Weekly* called it "a recipe book for pointy-heads who live deep in the nervous system of the global financial system" (you, that is). It remains a classic for those recipes, but it also signaled the author's philosophic bent and distrust of conventional mathematical wisdom with sections like "The Illusion of Profitability," "The Greater Fool Theory," "Monkeys on a Typewriter," "Holes, Black Scholes



and the Illusion of Memory," "There Is No Such Thing as Constant Volatility and Correlation," "Changes In the Rules of the Game" and "Fooled by the Greeks."

Four years later, Nassim expanded those thoughts into a full book, *Foiled by Randomness*. *Publishers Weekly* was still not impressed, "While serious investors and mathematics enthusiasts will be intrigued, readers looking for practical

investment strategies will be disappointed by this rambling intellectual discourse." The public disagreed. *Foiled by Randomness* became a surprise bestseller. It reached far beyond financial quants to enter into the general intellectual culture.

Now Nassim has published a more ambitious philosophical statement and elaboration of the same core ideas. *The Black Swan* is less about finance than the earlier work and more about

the nature of knowledge, along with history, philosophy, life advice, current affairs and (yes) some mathematics and finance. I suspect this time even *Publishers Weekly* will like the book, and that it will far surpass even *Fooled by Randomness* in sales. Even if it weren't a great book, you should read it because it will be a powerful force in shaping public attitudes toward quantitative finance.

The "Black Swan" of the title is defined as:

First, it is an outlier, as it lies outside the realm of regular expectations, because nothing in the past can convincingly point to its possibility. Second, it carries an extreme impact. Third, in spite of its outlier status, human nature makes us concoct explanations for its occurrence after the fact making it explainable and predictable."

Nassim claims that a small number of Black Swans determine the course of history, and of individual lives. Predicting them is impossible. The correct strategy is to prepare for the broadest set of occurrences possible, so negative Black Swans do not ruin you and you are in a position to exploit positive Black Swans. At an even higher level, try to live elegantly. Your life's results may be almost entirely random, but you can still get style points along the way.

Before tackling the thorny philosophical and practical problems of Black Swans, let's consider black swans. The family *Anatidae* covers ducks, geese and swans. Geese are big ducks, and swans are long-necked geese. Ducks and geese display a range of colorations, but genus *Cygnus* contains three species collectively found throughout Europe and Asia, all are pure white. They are distinguished by sound, the common names are Whooper Swan, Whistling Swan and Mute Swan.

The whiteness of swans became a byword, like the blackness of ravens. Philosophers even published proofs that swans must be white. Then, in 1697, Dutch explorer Willem de Vlamingh found *Cygnus atratus* in Australia. He didn't call it that, since it was black it could not be *Cygnus* by definition. It was named *Chenopsis chenopsis*. But it is almost identical to the Mute Swan in everything but color, and it was eventually reclassified.

Of course, Vlamingh didn't discover the bird, the natives had long known of its existence (in

fact, New Zealand natives had already hunted its cousin to extinction). Later, *Cygnus melanocoryphus* and *Coscoroba coscoroba* were noticed by Europeans in South Africa. Both have black necks, although only the former is a true swan.

The whole matter might have been forgotten, except Karl Popper revived it to illustrate a problem of induction. However many confirming instances you have of the statement "all swans are white," it takes only one black swan to prove the statement false. Now Nassim has resurrected that discussion and extended it in important ways.

I'm more literal-minded than Nassim, who seems determined to etherealize himself into

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pure thought like the Organians on *Star Trek*. Real black swans clearly meet the first leg of the Black Swan definition; from a European perspective in 1696 they were unexpected, nothing in the past pointed convincingly to its possibility. However they do not meet the second leg in general, they did not have extreme impact.

The third leg of the definition is that explanations are rapidly concocted after the fact. This did not happen. Animal coloration is still an area of active research, with few firm universal principles. Generally speaking, birds have excellent color vision. Small, fast flying birds have small need for camouflage, so they tend to have striking coloration used for sexual display and subspecies identification. Larger, slower birds that spend more time on the ground tend to have protective coloration, usually shaded earth tones or single colors that blend into the background (like white snowbirds). But there are clear exceptions, like peacocks. In any case, this can explain neither white nor black swans. Their coloration should be more protective than ducks or geese as they are larger and slower, and non-migratory so identification is less important.

In fact, the (wrong) explanations were all con-

cocted *before* the fact. When all swans were white, lots of people thought they knew the reasons. When you had to explain white *and* black swans, and why all Northern hemisphere and no Southern hemisphere swans were pure white, no one raised a hand. So the literal black swan did the opposite of what a Nassimian Black Swan is supposed to do. It shattered complacency and stimulated a valuable body of research that remains open today.

Thinking a little more deeply, it's not even clear the first leg is solid. Sure, most Europeans in 1696 probably would have told you that all swans are white. But what would they have really meant by that? Imagine the following dialog:

**Neronio of Tulipia:** "Do you think all swans are white?"  
Cheerful peasant: "Sure."

**NT:** "Why?"

**CP:** "Everyone says so, and all the swans I've seen are white."

**NT:** "Suppose I told you that 10,000 miles away, across uncharted lands and seas, there exist ... BLACK ... SWANS!"

**CP:** "That's nice."

**NT:** "You're not shocked?"

**CP:** "Why would I be? All I know is the swans around here. They seem to be all white. But it doesn't mean much to me one way or the other."

People may underestimate unexpected tail events, but the literal black swan doesn't prove that. Reasoning from what you see every day and what people tell you is often all you need. So suppose Neronio seeks out Herr Professor Schwanexperte, who wrote the classic *Schwäne Sind Immer Weiß*:

**Neronio of Tulipia:** "Do you think all swans are white?"  
Herr Professor Schwanexperte: "I don't think it. I know it. I have proved it. Buy my book."

**NT:** "I'll bet I can produce a black swan. What odds will you give me?"

**HPS:** "No bet. *Compre mi libro.*"



## Observations change our beliefs in proportion to their unexpectedness relative to previous beliefs

**NT:** “But you said you were sure all swans are white.”  
**HPS:** “That’s just philosophy. You’re talking real money. *Kaufen Sie mein Buch.*”

Of course, there were people to whom black swans would be Black Swans, unexpected life-changing events. A naturalist could make a reputation, an exotic animal dealer could make a fortune. But these people were well aware of the limitations of knowledge. They combed through remote places in Europe and flocked to voyages of discovery. They weren’t looking specifically for black swans. The odds of finding one were too low. But they knew they had good chances of making some important or profitable discovery.

From the perspective of a modern quant, there are several problems with the reasoning that all swans are white because you’ve seen a few thousand white swans, no non-white swans and no one you know reports seeing a white swan. To perform rigorous induction, we need a random sample from a well-defined population. Since our sample is exclusively European swans that come near humans, we should restrict our conclusions to that population. *The Black Swan* is certainly correct that people tend to overestimate the breadth of observations supporting common conclusions.

Another error that leads to overconfidence is thinking there are more and better observations than there really are. If there were a few non-white swans around, most people wouldn’t notice. They’d have to see one close up in the daytime, and even then they’d probably assume it was a long-necked goose, or a dirty swan. If they reported a non-white swan, they would probably not be believed. Unless there were a stable subpopulation of non-white swans we would not expect rare exceptions to be reported.

Even when people know the amount and quality of the data, they are often overconfident about conclusions. Suppose that you had perfectly reliable observations of one million swans randomly selected from all swans in Europe, and all of them were white. A 95 per cent confidence interval for the proportion of swans that are white is 0.999997 to 1. Assuming a total

European swan population of ten million, the statistical evidence only supports the statement that it’s unlikely, but by no means impossible, that there are more than 30 non-white swans in Europe.

From a statistician’s perspective, the observation of a single black swan is not qualitatively different from the observation of white swans. If the million-and-first swan we examine is black, then our confidence interval for the proportion of non-white swans in Europe becomes 0.9999955 to 0.99999947. We now think it unlikely that there are fewer than two or more than 46 non-white swans among the ten million population. Except to a philosopher, that’s not so different from our zero to 30 estimate before we saw the black swan.

It’s true that the black swan changes our confidence interval one million times as much as seeing one more white swan. Observations change our beliefs in proportion to their unexpectedness relative to previous beliefs. This is why seeking confirmation of what we believe to be true is often less productive than seeking refutation. People tend to confirm too much, because the attempt succeeds more often than looking for refutation. But it’s a matter of costs and benefits. If confirmations can be recorded for a penny and refutations (if they exist) cost a trillion dollars each to find, confirmation is the cost-effective way to investigate, at least until you get 100 trillion confirmations.

This perspective also disposes of the logical problem that a non-white non-swan (a red car, for example) is a confirmation of the statement “all swans are white” (since this is logically equivalent to “all nonwhite things are not swans”). The population of nonwhite things is so large relative to the population of swans that the confirmation value of a red car is a tiny fraction of the confirmation value of a white swan. But there is no logical problem here, only a matter of degree.

*The Black Swan* is a great book that delves into this and many other issues. It may emerge as the most important intellectual contribution to arise from quantitative finance. It will make a lot of people angry, some for what it says, more for how it says it. But it will stimulate more thought than ire.