The "Long Peace" is a Statistical Illusion

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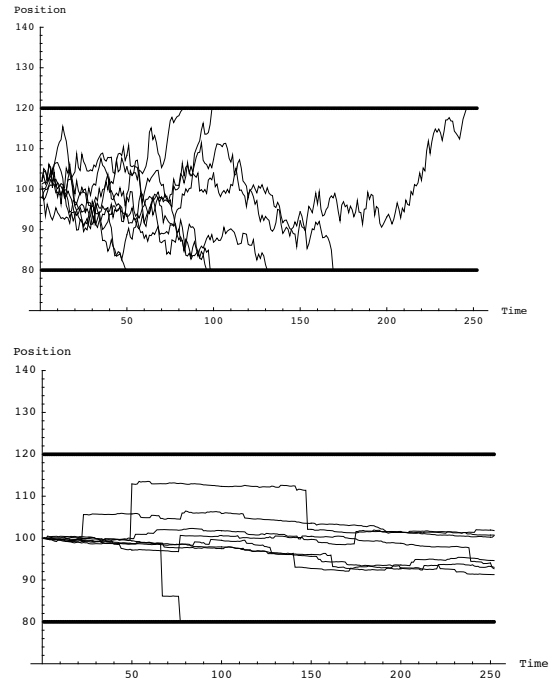
These are points I am throwing on the web (for discussion) in preparation for an article (with Scott Atran). I may forget the article and leave this as a standalone note.

When I finished writing *The Black Swan*, in 2006, I was confronted with ideas of "great moderation", by people who did not realize that the process was getting fatter and fatter tails (from operational and financial, leverage, complexity, interdependence, etc.), meaning *fewer but deeper* departures from the mean. The fact that nuclear bombs explode less often that regular shells does not make them safer. Needless to say that with the arrival of the events of 2008, I did not have to explain myself too much. Nevertheless people in economics are still using the methods that led to the "great moderation" narrative, and Bernanke, the protagonist of the theory, had his mandate renewed.

I had argued that we were undergoing a switch between the top graph (continuous low grade volatility) to the next one, with the process moving by jumps, with less and less variations outside of jumps.



My idea of current threats outside finance:

1. **Loss of the *Island Effect*:** My point now is the loss of island effect, from interconnectedness. The number one danger is a biological agent that can travel on British Air and reach the entire planet. And it can be built in a high school lab, or, even, a garage.
2. **Nuclear Potential**: As I explain in *Antifragile,* risk management is about fragility, not naive interpretation of past data. If Fannie Mae is sitting on a barrel of dynamite I would not use past statistical data for my current analysis. Risks are in the fragility.(**Sensitivity to counterfactuals** is more important than past history, something Greenspan missed in his famous congressional testimony).

The Pinker Argument

Now to my horror I saw an identical theory of great moderation produced by Steven Pinker with the same naive statistically derived discussions (>700 pages of them!).

1. I agree that diabetes is a bigger risk than murder --we are victims of sensionalism. But our suckerdom for overblown narratives of violence does not imply that the risks of large scale violent shocks have declined. (The same as in economics, people's mapping of risks are out of sync *and* they underestimate large deviations). We are just bad at evaluating risks.
2. Pinker conflates nonscalable Mediocristan (death from encounters with simple weapons) with scalable Extremistan (death from heavy shells and nuclear weapons). The two have markedly distinct statistical properties. Yet he uses statistics of one to make inferences about the other. And the book does not realize the core difference between scalable/nonscalable (although he tried to define powerlaws). He claims that crime has dropped, which does not mean anything concerning casualties from violent conflict.
3. Another way to see the conflation, Pinker works with a times series process without dealing with the notion of temporal homogeneity. Ancestral man had no nuclear weapons, so it is downright foolish to assume the statistics of conflicts in the 14th century can apply to the 21st. A mean person with a stick is categorically different from a mean person with a nuclear weapon, so **the emphasis should be on the weapon** and not exclusively on the psychological makup of the person.

4. The statistical discussions are disturbingly amateurish, which would not be a problem except that the point of his book is statistical. Pinker misdefines fat tails by talking about *probability* not contribution of rare events to the higher moments; he somehow himself accepts powerlaws, with low exponents, but he does not connect the dots that, if true, statistics can allow no claim about the mean of the process. Further, he assumes that data reveals its properties without inferential errors. He talks about the process switching from 80/20 to 80/02, when the first has a tail exponent of 1.16, and the other 1.06, meaning they are statistically indistinguishable. (Errors in computation of tail exponents are at leat .6, so this discussion is noise, and as shown in [1], [2], it is lower than 1. (It is an error to talk 80/20 and derive the statistics of cumulative contributions from samples rather than fit exponents; an 80/20 style statement is interpolative from the existing sample, hence biased to clip the tail, while exponents extrapolate.)
5. He completely misses the survivorship biases (which I called the Casanova effect) that make an observation by an observer whose survival depends on the observation invalid probabilistically, or to the least, biased favorably. Had a nuclear event taken place Signor Pinker would not have been able to write the book.
6. He calls John Gray's critique "anecdotal", yet it is more powerful statistically (argument of *via negativa*) than his >700 pages of pseudo-stats.
7. Psychologically, he complains about the lurid leading people to make inferences about the state of the system, yet he uses lurid arguments to make his point.
8. You can look at the data he presents and actually see a rise in war effects, comparing pre-1914 to post 1914.
9. **Recursing a Bit** (Point added Nov 8): Had a book proclaiming The Long Peace been published in $1913\frac{3}{4}$ it would carry similar arguments to those in Pinker's book.

Is The World Getting Less Safe?

When writing *The Black Swan*, I was worried about the state of the system from the new type of fragility, which I ended up defining later. I had noted that because of connectedness and complexity, earthquakes carried a larger and larger proportional economic costs, an analysis by Zajdenwebber which saw many iterations and independent rediscoveries (the latest in a 2012 *Economist* article). The current deficit is largely the result of the (up to) $3 trillion spent after September 11 on wars in Afganistan and Iraq.

But connectedness has an even larger threat. With biological connectedness, the Island Effect is gone both economically and physically: tails are so fat ...

{Technical Appendix}

Pinker's Rebuttal of This Note

Pinker has written a rebuttal (*ad hominem* blather, if he had a point he would have written something $\frac{1}{3}$ of this, not 3 x the words). He still does not understand the difference between probability and expectation (drop in observed volatility/fluctualtion ≠ drop in risk) or the incompatibility of his claims with his acceptance of fat tails (he does not understand asymmetries-- from his posts on FB and private correspondence). Yet it was Pinker who said "what is the actual risk for any individual? It is approaching zero".

Second Thoughts on The Pinker Story: What Can We Learn From It

It turned out, the entire exchange with S. Pinker was a *dialogue de sourds*. In my correspondence and exchange with him, I was under the impression that he simply misunderstood the difference between inference from symmetric, thin-tailed random variables an one from asymmetric, fat-tailed ones --the 4th Quadrant problem. I thought that I was making him aware of the effects from the complications of the distribution. But it turned out things were worse, a lot worse than that.

Pinker doesn't have a clear idea of the difference between science and journalism, or the one between rigorous empiricism and anecdotal statements. Science is not about making claims about a sample, but using a sample to make general claims and discuss properties that apply outside the sample.

Take M^* the observed arithmetic mean from the realizations (a sample path) for some process, and M the "true" mean. When someone says: "Crime rate in NYC dropped between 2000 and 2010", the claim is about M^* the observed mean, not M the true mean, hence the claim can be deemed merely journalistic, not scientific, and journalists are there to report "facts" not theories. No scientific and causal statement should be made from M^* on "why violence has dropped" unless one establishes a link to M the true mean. M^* cannot be deemed "evidence" by itself. Working with M^* cannot be called "empiricism".

What I just wrote is at the foundation of statistics (and, it looks like, science). Bayesians disagree on how M^* converges to M, etc., never on this point. From his statements, Pinker seems to be aware that M^* may have dropped (which is a straight equality) and sort of perhaps we might not be able to make claims on M which might not have really been dropping.

Now Pinker is excusable. The practice is widespread in social science where academics use mechanistic techniques of statistics without understanding the properties of the statistical claims. And in some areas not involving time series, the differnce between M^* and M is negligible. So I rapidly jot down a few rules before showing proofs and derivations (limiting M to the arithmetic mean). Where E is the expectation operator under "real-world" probability measure P:

1. **Tails Sampling Property**: $E[|M^*-M|]$ increases in with fat-tailedness (the mean deviation of M* seen from the realizations in different samples of the same process). In other words, fat tails tend to mask the distributional properties.
2. **Counterfactual Property:** Another way to view the previous point, $\mu[M^*]$, The distance between different values of M^* one gets from repeated sampling of the process (say counterfactual history) increases with fat tails.
3. **Survivorship Bias Property**: $E[M^*-M]$ increases under the presence of an absorbing barrier for the process. (Casanova effect)
4. **Left Tail Sample Insufficiency:** $E[M^*-M]$ increases with negative skeweness of the true underying variable.

5. **Asymmetry in Inference**: Under both negative skewness and fat tails, negative deviations from the mean are more informational than positive deviations.
6. **Power of Extreme Deviations (N=1 is OK)**: Under fat tails, large deviations from the mean are vastly more informational than small ones. They are not "anecdotal". (The last two properties corresponds to the black swan problem).

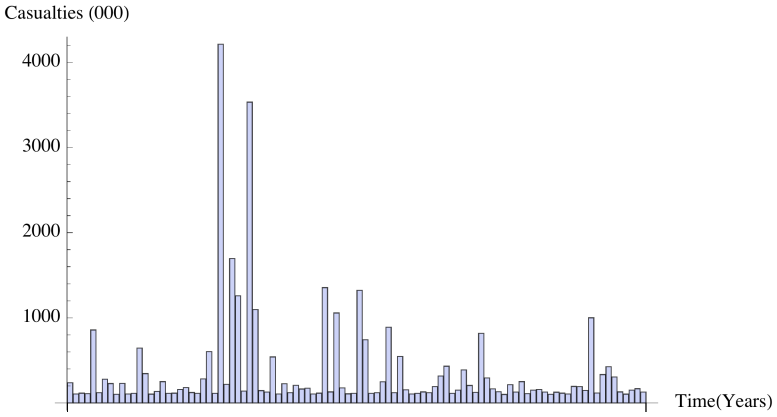


Fig1 **First 100 years (Sample Path):** A Monte Carlo generated realization of a process of the "80/20 or 80/02 style" as described by Pinker's book, that is tail exponent α 1.1, dangerously close to 1

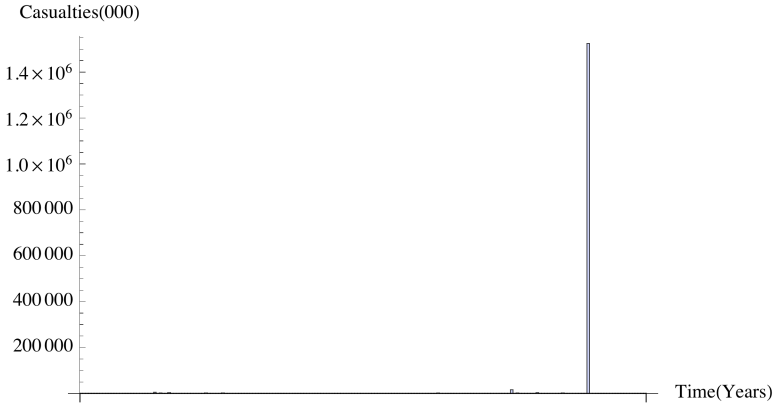


Fig 2: **The Turkey Surprise**: Now 200 years; showing the total with the remaining 100 years; these are realizations of the exact same process as before.