

# Practitioner Roundups

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## Do Variance Aftereffects Distort Risk Perception?

Conventional economic theory assumes a true and accurate perception of risk. But, due to sensory aftereffects, people wrongly perceive their physical environment. Could a variance aftereffect exist? And, if so, how could it distort risk perception?

In many contexts, decision-making requires an accurate representation of outcome variance—otherwise known, in economics, as “risk”. Conventional economic theory assumes such a representation to be perfect, and thus focuses on risk preferences rather than risk perception per se. A well-known example of this is the mean-variance framework for portfolio allocation developed by Nobel Prize winner Harry Markowitz in 1952.

*“People often misrepresent their environment due to sensory aftereffects. Could a variance aftereffect exist?”*

People, however, often misrepresent their physical environment. Perhaps the most striking of these misrepresentations are the many well-known sensory aftereffects that most commonly involve visual properties such as color, contrast, size, and motion. For example, observing the downward motion of a waterfall induces the anomalous, biased perception of upward motion when one subsequently focuses one’s attention on the static rocks situated beside the cascading water. Given that aftereffects are pervasive, occurring across a wide range of time horizon and stimulus dimensions (including properties such as face perception, gender, and numerosness), and that the literature contains some evidence that neurons exhibit adaptation to variance in terms of the sole visual feature, motion, it is interesting to assess whether aftereffects distort people’s perception of variance—that is to say, is there a variance aftereffect?

*“Experiments were conducted with more than 250 subjects: prolonged exposure to extreme variance distorts our perception of risk.”*

The authors measure the effects of prior adaptation on the perception of variance, using several novel techniques to precisely control the nature and degree of variance across a range of different visual representations.

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The full paper can be found at <http://bit.ly/2aMy8ut>.

#### Key Words

Cognitive  
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Subjects were, for example, presented with dynamic price trajectories simulated with different levels of volatility—a setup very similar to that which a trader would be looking at on a trading platform.

Experiments were conducted with more than 250 subjects, and the authors found that perceived variance decreases following prolonged exposure to high variance and increases following exposure to low variance within a number of different visual representations of variance. These aftereffects were demonstrated to occur across very different visual representations of variance, suggesting that rather than being merely sensory they operate at a high (cognitive) level of information processing. The results suggest, therefore, that variance constitutes an independent cognitive property and that prolonged exposure to extreme variance distorts risk perception. So, to answer our initial question: Yes, there is a variance aftereffect.

*“The results have far-reaching implications for the business community.”*

One implication of these findings is that variance aftereffects may impact investors' behavior, and that they hence have a meaningful impact on asset prices and market dynamics. Preliminary results show that such aftereffects are evident in investors' perceptions of S&P 500 volatility and cause significant distortions of S&P 500 options prices. More precisely, after prolonged exposure to high (low) volatility, the marginal trader underestimates (overestimates) volatility. This observation is in stark contrast with conventional economic theory, which assumes no biases in risk perception. Importantly, almost all risk measures are related to variance and should therefore be affected by the perception of variance. Examples of such risk measures that immediately come to mind are the Beta of the Capital Asset Pricing Model and Value-at-Risk, a central element in the calculation of capital requirements. The results thus have far-reaching implications for the business community.

*“Chronically high levels of risk and the dangers of “risk blindness”.”*

Further, the study may help us to understand the phenomenon of “rogue trading”, which has received considerable attention in recent years. It has been proposed that rogue traders have a heightened appetite for risk fuelled by management omissions and regulatory gaps. This paper's findings point to a complementary root cause—adaptation to chronically high levels of risk and possible subsequent “risk blindness”.

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