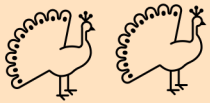
OVERCONFIDENCE



EE434 SEM1/2022
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FACTORS IMPEDING CORRECTION

Biases interfering with learning

Some biases contribute to overconfidence, such as:

- Self-attribution bias
- Confirmation bias
- Hindsight bias

Self-attribution bias

Self-attribution bias is the tendency for people to attribute successes or good outcomes to their own abilities ,while blaming failures on circumstances beyond their control.

This can lead to an increase in overconfidence.

Self-attribution bias

- Suppose an overconfident individual observes personal performance outcomes that are logically a combination of external and internal (to the individual) forces.

- If things go well, the thinking will be that this is because of great ability, skill, or knowledge (much more so than an objective consideration of circumstances would warrant), and the result will be an increase in overconfidence.

Gervais, S., and T. Odean, 2001, "Learning to be overconfident," Review of Financial Studies 14, 1–27;

Self-attribution bias

- On the other hand, adverse events, being only moderately ascribed to personal forces, will not lead to symmetric (but of opposite sign) revisions in overconfidence.

- Perhaps, people might “learn” to be overconfident.

Gervais, S., and T. Odean, 2001, “Learning to be overconfident,” Review of Financial Studies 14, 1–27;

Confirmation bias

- Confirmation bias is the tendency to search out evidence consistent with one's prior beliefs and to ignore conflicting data.
- People who hold strong opinions on complex social issues are likely to examine relevant empirical evidence in a biased manner.
- They are apt to accept "confirming" evidence at face value while subjecting "discontinuing" evidence to critical evaluation.
- People perceive ambiguous information as supportive of their current beliefs.

Lord, C. G., L. Ross, and M. R. Lepper, 1979, "Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence," Journal of Personality and Social Psychology 37, 2098–2109

Hindsight bias

Hindsight bias is defined as the belief that an event is more predictable after it becomes known than it was before it became known.

Hindsight bias occurs when people feel that they "knew it all along".

Hindsight bias involves the inability to recapture the feeling of uncertainty that preceded an event.

Roese NJ, Vohs KD. Hindsight Bias. *Perspectives on Psychological Science*. 2012;7(5):411-426. doi:10.1177/1745691612454303

Biais, B., & Weber, M. (2009). Hindsight Bias, Risk Perception, and Investment Performance. *Management Science*, *55*(6), 1018–1029. http://www.jstor.org/stable/40539277

Hindsight bias

Hindsight bias embodies any combination of three aspects:

- memory distortion,
- beliefs about events' objective likelihoods, or
- subjective beliefs about one's own prediction abilities.

Roese NJ, Vohs KD. Hindsight Bias. *Perspectives on Psychological Science*. 2012;7(5):411-426. doi:10.1177/1745691612454303

Hindsight bias

Consequences of hindsight bias include:

- myopic attention to a single causal understanding of the past (to the neglect of other reasonable explanations) as well as
- general overconfidence in the certainty of one's own judgement.

Roese NJ, Vohs KD. Hindsight Bias. *Perspectives on Psychological Science*. 2012;7(5):411-426. doi:10.1177/1745691612454303

A formal definition of hindsight bias

Suppose that an individual is asked at time t to predict the outcome of an uncertain event, X, that will take place at some time $t + j, j > 0$.

Denote the information set at time t by I_t.

Then the individual's *predictive judgment* is reflected by the conditional prediction:

$$E[X|I_t]$$

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Camerer, C. F., Loewenstein, G., and Weber, M. (1989). The curse of knowledge in economic settings: an experimental analysis. Journal of Political Economy 97: 1232–54.

A formal definition of hindsight bias

Suppose that at time $t + j, j > 0$, the realization of the random variable is x.

Posterior to the observation of x, the individual is asked about the remembered prediction or *the postdictive judgment*. This is given by:

$$E\left[E[X|I_t]|I_{t+j}\right]$$

, where I_{t+j} is date $t + j$ information set, and $I_t \subset I_{t+j}$.

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Camerer, C. F., Loewenstein, G., and Weber, M. (1989). The curse of knowledge in economic settings: an experimental analysis. Journal of Political Economy 97: 1232–54.

A formal definition of hindsight bias

In neoclassical economics, the typical assumption is:

$$E[X|I_t] = E\left[E[X|I_t]|I_{t+j}\right]$$

An individual is said to suffer from hindsight bias), if the predictive and postdictive judgments differ, i.e.,

$$E[X|I_t] \neq E\left[E[X|I_t]|I_{t+j}\right]$$

and the postdictive judgment is biased in favor of the actual outcome.

A formal definition of hindsight bias

For example,

$$E\left[E[X|I_t]|I_{t+j}\right] = \alpha x + (1-\alpha)E[X|I_t]; \alpha \in [0,1]$$

The individual:

- has no hindsight bias if $\alpha = 0$
- is fully-biased if $\alpha = 1$.

Hindsight bias, the “I knew it all along” effect, is particularly obvious when $\alpha = 1$.

How is hindsight bias relevant for actual financial markets?

Decision making in financial markets relies crucially on information processing and learning.

Efficient learning requires comparing new information to previous expectations.

Biais, B., & Weber, M. (2009). Hindsight Bias, Risk Perception, and Investment Performance. Management Science, 55(6), 1018–1029. http://www.jstor.org/stable/40539277

How is hindsight bias relevant for actual financial markets?

For example, after earnings announcements, investors must compare the news to their prior expectations. They must take into account the information content of the difference between the former and the latter.

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How is hindsight bias relevant for actual financial markets?

The hindsight bias, which is the inability to correctly remember one's prior expectations after observing new information, hinders such information processing.

In investment and trading, hindsight-biased agents fail to assess variances correctly.

Biais, B., & Weber, M. (2009). Hindsight Bias, Risk Perception, and Investment Performance. Management Science, 55(6), 1018–1029. http://www.jstor.org/stable/40539277

How is hindsight bias relevant for actual financial markets?

When volatility is stochastic, traders need to update their assessment of risk, based on return realization.

On observing unexpectedly positive or negative returns, rational agents should raise their volatility estimates.

Biais, B., & Weber, M. (2009). Hindsight Bias, Risk Perception, and Investment Performance. Management Science, 55(6), 1018–1029. http://www.jstor.org/stable/40539277

How is hindsight bias relevant for actual financial markets?

Hindsight-biased agents, who "knew it all along," fail to understand that such returns were unexpected, and thus underestimate variance.

More generally, hindsight-biased agents will form inaccurate beliefs about asset returns, leading to suboptimal trades and inferior financial performance.

Biais, B., & Weber, M. (2009). Hindsight Bias, Risk Perception, and Investment Performance. Management Science, 55(6), 1018–1029. http://www.jstor.org/stable/40539277

Hindsight bias and the underestimation of financial volatility

Let the predictive judgment $E[X|I_t] = \mu$

Let the postdictive judgment $E\left[E[X|I_t]|I_{t+j}\right] = \hat{\mu}$

Then we can write $E\left[E[X|I_t]|I_{t+j}\right] = \alpha x + (1-\alpha)E[X|I_t]$ as:

$$\hat{\mu} = \alpha x + (1-\alpha)\mu \quad (1.)$$

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Hindsight bias and the underestimation of financial volatility

Suppose that an investor at time t forecasts the average returns at time $t + \mathrm{j}$ on an asset, or a portfolio of assets.

At time t , the investor believes that, with probability λ, the random asset return $X \sim N(\mu, \sigma_L^2)$ and with probability $1 - \lambda$, $X \sim N(\mu, \sigma_H^2)$, $\sigma_L^2 < \sigma_H^2$

After observing one realization of asset return X, x at time $t + \mathrm{j}$, the agent has to update her beliefs about the true variance that generated x (σ_L^2 or σ_H^2).

Biais, B., & Weber, M. (2009). Hindsight Bias, Risk Perception, and Investment Performance. Management Science, 55(6), 1018–1029. http://www.jstor.org/stable/40539277

Hindsight bias and the underestimation of financial volatility

However, at the end of time $t + j$, on account of hindsight bias, the remembered mean is $\hat{\mu}$.

Hindsight-biased agents would update the probability that the variance is low, σ_L^2, to:

$$\hat{P}(\sigma_L^2|x) = \frac{f(x|\sigma_L^2,\hat{\mu})\lambda}{f\left(x\middle|\sigma_L^2,\hat{\mu}\right)\lambda + f(x|\sigma_H^2,\hat{\mu})(1-\lambda)} \qquad (2.)$$

,where $f\left(x\middle|\sigma_i^2,\mu\right) = \frac{1}{\sqrt{2\pi\sigma_i^2}} exp\left(-\frac{1}{2\sigma_i^2}(x-\mu)^2\right), i = L, H$

Hindsight bias and the underestimation of financial volatility

Hindsight-biased agents would update the probability that the variance is low, σ_L^2, to:

$$\hat{P}(\sigma_L^2|x) = \frac{f(x|\sigma_L^2,\hat{\mu})\lambda}{f\left(x\middle|\sigma_L^2,\hat{\mu}\right)\lambda + f(x|\sigma_H^2,\hat{\mu})(1-\lambda)} \qquad (2.)$$

Substituting $f\left(x\middle|\sigma_i^2,\mu\right)$,

$$\hat{P}(\sigma_L^2\middle|x) = \frac{1}{1+\left(\frac{1-\lambda}{\lambda}\right)\frac{\sigma_L}{\sigma_H}exp\left(-\frac{1}{2}\left(\frac{1}{\sigma_H^2}-\frac{1}{\sigma_L^2}\right)(x-\hat{\mu})^2\right)} \qquad (3.)$$

Hindsight bias and the underestimation of financial volatility

Hindsight-biased agents would update the probability that the variance is low, σ_L^2, to:

Substituting $\hat{\mu}$,

$$\hat{P}(\sigma_L^2|x) = \frac{1}{1+\left(\frac{1-\lambda}{\lambda}\right)\frac{\sigma_L}{\sigma_H} exp\left(-\frac{1}{2}\left(\frac{1}{\sigma_H^2}-\frac{1}{\sigma_L^2}\right)(1-\alpha)^2(x-\mu)^2\right)} \qquad (3.)$$

Hindsight bias and the underestimation of financial volatility

In the absence of hindsight bias $\alpha = 0$, we get the posterior probability as in typical models in economics and finance, (3.) turns to:

$$\hat{P}(\sigma_L^2|x) = \frac{1}{1+\left(\frac{1-\lambda}{\lambda}\right)\frac{\sigma_L}{\sigma_H} exp\left(-\frac{1}{2}\left(\frac{1}{\sigma_H^2}-\frac{1}{\sigma_L^2}\right)(x-\mu)^2\right)} = P(\sigma_L^2|x) \qquad (4.)$$

Hindsight bias and the underestimation of financial volatility

Compare (3.) vs. (4.)

$$\hat{P}(\sigma_L^2|x) = \frac{1}{1+\left(\frac{1-\lambda}{\lambda}\right)\frac{\sigma_L}{\sigma_H}exp\left(-\frac{1}{2}\left(\frac{1}{\sigma_H^2}-\frac{1}{\sigma_L^2}\right)(1-\alpha)^2(x-\mu)^2\right)} \quad (3.)$$

$$P(\sigma_L^2|x) = \frac{1}{1+\left(\frac{1-\lambda}{\lambda}\right)\frac{\sigma_L}{\sigma_H}exp\left(-\frac{1}{2}\left(\frac{1}{\sigma_H^2}-\frac{1}{\sigma_L^2}\right)(x-\mu)^2\right)} \quad (4.)$$

Since $-\frac{1}{2}\left(\frac{1}{\sigma_H^2}-\frac{1}{\sigma_L^2}\right) > 0$, $\frac{\partial \hat{P}\left(\sigma_L^2|x\right)}{\partial \alpha} > 0$. $\hat{P}(\sigma_L^2|x)$ increases with hindsight bias.

Hindsight bias and the underestimation of financial volatility

- Decision makers who are subject to hindsight bias infer, ex-post, that volatility is likely to be low rather than high.
- Furthermore, the degree of underestimation of volatility is increasing in the degree of hindsight bias, as captured by the size of α.
- Since hindsight biased decision makers underestimate volatility, if they have to invest in the relevant asset/portfolio, they will invest more than they really should particularly if they are risk averse.

THANKS!

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