Fallacies - A Short Guide

An unofficial collection of fallacies, primarily organised based on the writings by Nassim Taleb.

Note that the types associated with the fallacies are also a oversimplification. Typically, these fallacies are connected.

Calibration Fallacies (Type 1)

Do not use non-statistically significant evidence.

No one-sided arguments, cherry-picking, nit-picking, anecdotal evidence, conspiracy theories as evidence. Examples: sensational anecdote versus strength of evidence. Typically paired up with financial and medical quackery, disinformation and conspiracy theorizing.

Exceptions are advocacy or commentary implicitly look one-sided since the other side is encoded within the arguments. Example: Bernoulli trial, if probability of truth is $p = 0.8$, then probability of non-truth is $(1-p) = 0.2$.

No non-statistically significant evidence. Example: using small deviations to inform fat-tailed distributions, ignoring dimensionality.

Do not use Bayesian methods with unreliable priors. One can use Bayesian methods with reliable priors (these may not be readily observable) when (1) one has a clear idea on the range of values, (2) these parameters follow a tractable distribution with low variance.

Do not ignore silence in processes.

Do not ignore “non-events”. Examples: ignoring peaceful history or historical events without agents acting or ahistoric selection.

Do not ignore contributions or realisations from the silent ensemble. Example: ignoring those who did not survive (survivorship bias) or overestimating the power of messiahs.

Do not ignore error bounds. Example: estimate exactly that something has a probability of zero where there is estimation error, or estimating the number of fatalities arguing for a small error bound as opposed to considering the error in the the tail exponent of fatalities in pandemics.

Do not forget to take into account second order errors where one needs to understand to think about second order errors and think it all the way to the limit.

Do not forget about implicit, non-demonstrative knowledge that is derived from experience. Example: engineering, customs, dogma in religious sense, and esoteric theology.

One, for example, can randomly remove a proportion of events and repeat the analysis to check the dependence of the analysis on missing events.

Do not ignore fundamental generators in favour of realisation.

We do not observe probability distributions, just realisations. A probability distribution cannot tell you if the realisation belongs to it. One needs a meta-probability distribution to talk about tail events. This is the conditional probability for the variable to belong in a certain class of distribution versus others.

Do not fail to check for false generators. For example, starting from a preconception then concentrating only on phenomena which seem to support that bias. Try to list all possible premises.

Do not ignore opaque heuristics. These are routines that are done for a long time, that are stuck to for unknown reasons, and does not seem to make sense. Example: religion.

Do not mistake important and necessary knowledge for another less externally visible or tractable knowledge. A corollary is that theoreticians weigh relevant knowledge wrongly.

Do not compare or draw analogies between phenomena with different distributions and statistical properties.

Inference is not symmetric under fat-tailed domains. You need more data to assert that there are no Black Swans than to assert that there are Black Swans.

The probability of sampling higher than twice (2X) the random variable X once is higher than sampling higher than X twice in a row for an Extremistan distribution for large deviations.

One test of fat-tailedness is to apply the law of large numbers to higher moments and see convergence. One can derive the kappa metric (rate of convergence of the law of large numbers for finite sums using the expected mean absolute deviation from the mean for a number of summands) to compare the distance from the limiting distribution (Levy alpha-stable basin), assessing the speed of law, comparing fat-tailedness or number of runs for Monte Carlo distribution (see Statistical Consequences of Fat Tails).

Another visualisation is to consider the contribution of the maximum to the total sum. This is the M-S plot. One can also compare the sample mean and estimated maximum likelihood mean.

Do not draw conclusions on the probability of a large deviation event in a fat tailed distribution.

Do not draw conclusions from invalid comparisons of a short volatility time series (left skewed, exposed to sharp losses) versus a long volatility one (right skewed, exposed to sharp gains).

Do not ignore large deviations, especially when it indicates that a distribution is fat-tailed. Example: Wittgenstein's ruler where a large deviation makes it Gaussian, so the table measures the ruler. As opposed to using a Gaussian distribution as a ruler to measure the table. One can attempt a plug-in by estimating the distribution and then extrapolating for the property. This is differentiating the true (or shadow) property from the realised property.

Do not fail to distinguish between calibration or probabilistic forecast errors from true payoffs and variations. Calibrations, a measure of one's prediction accuracy, lies in probability space between 0 and 1 and therefore is bounded.

Do not forget bounds. For example, a pandemic cannot grow exponentially, it follows a sigmoid due to bounds on number of people. Everything floored is convex, everything capped is concave.

Do not sample information in excess, especially when small deviation are have more sterile information compared to large deviations. Examples: arguments that summarise in one way, versus arguments that summarise in multiple ways for multiple readers.

Do not draw unfair comparisons between perishables and non-perishables. Nonperishable objects increase in life expectancy with each day, and cannot be compared with perishables.

Do not ignore multiplicative effects in distribution space. Pre-asymptotic failure due to state-switching and feedback loops between components such that thin-tailed random variables can produce multiplicative effects. Example: Do not compare pandemics (multiplicative) with car accidents (additive).

Do not confuse growth rate versus outcome since they are not in the same distribution class. Example: using point estimates of fatalities for a pandemic to manage risk, as opposed to the growth rate where errors in the growth rate are explosive due to exponentiation.

Do not use incorrect tail properties. Example (Lucretius): "The fool thinks the tallest mountain there is the tallest mountain he has seen."

Exposure Fallacies (Type 2)

Do not ignore consequences from statistics of higher order and convexity.

Do not ignore asymmetric situations where comparisons are made between objects where one has more to gain from volatility, randomness, errors, uncertainties, stressors and time. Example: false accusations causes irreversible reputation loss despite corrections.

Do not forget the second order implications of convexity. Example: More weight should be given to independent scholars conditional on the same rigor, due to the different risk exposures of independent scholars and academics in the system.

Do not prefer a false map to no map. Example: taking into account being memoryless and having the gift of seeing everything as if it was the for the first time. Could not be married to past opinions and be married to them. Similarly, Soros and Montaigne had better judgment, Montaigne had the wisdom of explicitly attributing the property of being lacking memory to his good judgment and his honesty.

Do not prefer efficiency over functional redundancy or tinkering.

Do not ignore situations where we can control exposures but not do a good calibration or forecast. For example: certain historical analyses can escape from narrative fallacies since they can be subjected to empirical rejection by documents and archeological evidence (Elster).

Do not confuse or judge by intention and reasoning as opposed to results. Example: a binary belief should map to a payoff under scaling or renormalization to probability space. A belief or prediction with two distinct outcomes map to the expectation of a binary random variable and bets with payoff {0, 1}. One can then check inconsistency against arbitrage rules like the Dutch Book argument. This binary belief is different from real world open continuous payoff.

Do not confuse or conclude of collapse in binary beliefs under fat-tailed distributions since there is no characteristic scale.

Do not remove real outliers that can indicate fat-tails.

Do consider the possibility of simulated annealing, where one reduces the energy of a system slowly to a minima to find an outcome. At each time step, the algorithm randomly selects a solution close to the current one, measures its quality, and moves to it according to the temperature-dependent probabilities of selecting better or worse solutions, which during the search respectively remain at 1 (or positive) and decrease toward zero.

Do not ignore non-linear effects, scaling and fractal locality.

Do not miss Jensen's inequality. Nonlinearity means that there is at least one scale at which functions of averages, at some scale, diverge from averages of sums. Example: for a convex payoff, the expectation of an average will be higher than the average of expectations.

Do not ignore the effects of fluctuating scales in processes i.e. heteroskedasticity in processes.

Do not deal with a situation in a more abstract form than required. Changes in size and quantities transform problems. Linked to Kantian universalism.

Do not ignore interaction from cross-dependencies.

Do not infer from the individual for aggregation to groups.

Do not validate an individual's characteristics that is naively drawn from groups. Example: partisanship.

Do not ignore minority rules that have renormalization. Corollary: minorities rules should have visibility corresponding to payoff. Example: kosher foods.

Do not create arguments that are susceptible to mistakes due to left-tailed payoff. Corollary: fallible arguments are those where the evidence used is sensitive to reasonable error bounds of premises. Corollary: arguments that with hormesis and benefit from stressors are more interesting.

Do not use golden rules that increase the likelihood of second order interventionism.

Do not ignore dynamics, ergodicity, computational irreducibility, and pre-asymptotics.

Do not forecast the future by adding, but by subtracting. Example: prescribing exact probabilities as opposed to using subtractive knowledge to determine bounds.

Do not ignore noise as a result of looking backwards at history or computation.

Do not ignore the need for filtering for payoff in systems. Example: numerous in Skin In The Game.

Do not use today's norms to judge ancients. Generally, do not forget to check if processes are non-anticipative. One must take filtrations at particular times that represent all historical but not future information with that time. Example: journalistic anachronism of Aristotle's opinion of slavery. Examples: organisms can only have non-anticipative strategies, therefore nature can only be nonpredictive. An immortal organism will need to be fit for all future random events. Post-event adaptation will always be late, this is an incompressible time lag.

Do not do cost-benefit analyses on problems with ruin exposure. Something that is break irreversibility, with long enough time, will eventually break.

Do not confuse time properties and ensemble properties. Corollary, do not ignore ensemble possibilities or alternate histories or possibilities of ruin when deriving time properties. Example: using ensemble probabilities or the law of large numbers for investors with one life. Example: not considering opportunity cost.

Do not perform analyses over time when you do not do the appropriate adjustments owing to process dynamics. For example, of using concentration and changes in concentration to justify that the world is becoming less violent a.k.a in Steven Pinker.

Do not ignore path dependence. Example: calling people engaging in sunk cost fallacy when they considered paths.

Do not ignore repeated exposures in path analyses or draw conclusions on single episode exposure.

Do not ignore problems where forecasts can be done by bypassing evolution in time, these are computationally irreducible problems. Most problems are computationally irreducible.

Metaphors, metonymy, symbolism that usually do not exist without a reason that cannot be perceived. One needs to analyse the time-frame of literary devices and context to see if it has imperceptible information and distinguish it from verbalism. Exception: abused by commentators who have no erudition.

Do not truncate dimensionality.

Do not oversimplify problems to fit a model.

Do not adopt Kantian universalism.

Do not conflate games and life. In real life probability is just a kernel inside a complicated payoff function and are not separable. Games truncate a dimension in reality. One example is the false conclusion that it is irrational to overestimate of probabilities when playing in single payoff games.

Do not ignore observer dependence. Example: entropy from computationally bounded observers; Black Swan for one observer, White Swan from the other.

Logical Fallacies (Type 3)

Do not misuse syllogisms.

Do not forget modus tollens: this is (1) if P then Q; (2) since Q is not true, then P is not true.

Do not affirm the consequent: this is (1) if P then Q; (2) since Q is true therefore P is true.
Example: false ad-hominem i.e. “Because you are an idiot, your statement is wrong.” versus “Because your statement is wrong, you are an idiot.”

Do not use circular reasoning or start with false presuppositions.

Do not deny the antecedent: this is (1) if P then Q; (2) since P is not true, therefore Q is not true.

Do not skip critical steps in reasoning.

Do not replace an opponent’s real argument with a weaker one (strawman).

Do not accept or reject an argument based on its origin, rather than content.

Do not conflate the necessary with the sufficient.

Avoid convoluted chains of reasoning.

Do not use words with no explicit definitions (verbalism).

Verbalism is the use of terms important to arguments where their meaning can change with context of circumstances and does not lend themselves to explicit definitions. Note that scholars do not need to produce codification to expressions used, but must be able to back-up every single term used. The problem is not using labels as shortcuts. The problem is thinking in terms of labels.

Verbalisms do not have rigidity of meaning. The criterion of rigidity of meaning is sufficient to spot verbalism. Verbalisms also hint at fallacies.

List of Verbalisms

(1) Ill-defined terms: “freedom of speech”, “globalist”, “”conservative”, “progressive”, “liberal”, “modern”, “populist”, “sectarian”

(1.1) Terms that require scale and degree: Examples: rate of change meant by “progressive”, rate of autarky in “globalist”. Especially in discussions where there is normalisation mechanics. Example: taken over by intolerant asymmetric minority (kosher foods)
Example: “conservative” means backward resisting all progress. Hayek’s separation from verbalistic notion of conservatism.

(2) Well-defined and rigid terms that does not correspond with their meaning. Examples include “correlation”, “volatility”, “regression”

(3) Terms stretched outside their original meaning: “nazi””, “fascist”, “racist”. Examples: bigoteering in general calling someone racist, chauvinist when not warranted. Second order siding with bigoteers is just as bad. Another example is retrospective bigoteering.

(4) Expressions without statistical significance: “evidence”, “causal”.

(5) Circular terms: ones that are explained by other terms that loop back to the same source. Example: “rationality” without mapping to the proper axiomatic framework of rationality.

(6) Words that do not have a robust mapping because they can have an arbitrary gerrymandered (boundaries of definition is manipulated and picked to work) definition that, not being, robust, changes according to periods. Examples include: “Western civilization”, “East-West divide”

(7) Substitution of one term for another. Examples: “democracy” with implication of “governance”, or “legal” for “ethical”

(8) Distinctions without a difference but presented as a matter of substance are verbalistic if the terms do not have rigidity of meaning. Note: distinctions can be with and without differences depending on contexts and uses.

(9) Euphemisms and exaggeration in rigorous thought.

(10) Ambiguous labels that can fool people.

Example: “Holy Roman Empire” was not a continuation of the Roman Empire (Byzantium was) but the name is potent enough to confuse people to believing the original (mostly) Franco-German European union that was the continuation of ancient Rome.

Example: “Arab” as a designation that could mean a Westerner (i.e. Mediterranean) or “foreigner” for Arabians and Peninsular people, while understood as “nomad” by some. Confuses people into political theories such as “Arab nationalism”

Examples: pedophrastry or using children to prop up arguments.