

Law of Large Numbers

The law of large numbers is a theory of statistical probability which says that the larger the number of events, the more accurate will be the prediction of the likelihood of the outcome of such events. Applied to insurance, the larger the number of exposure units independently exposed to loss, the greater the probability that actual loss experience will equal expected loss experience. In other words, the credibility of data increases with the size of the data pool under consideration.

An example of the reliability of the law of large numbers is an atomic clock. Scientists may examine a single atom of uranium and fail to predict whether that single atom will emit a sub-atomic particle in the next nanosecond or only after a thousand years. Nonetheless, a deposit of billions of uranium atoms does in fact release sub-atomic particles with such regularity that the atomic clock is the most accurate time piece in the universe, capable of accurately measuring the speed of light.

Insurance is based on the law of large numbers. In order to evaluate an insurable risk, underwriters rely upon the law of large numbers to make risk reliably predictable. For example, we are all going to die. Few of us can accurately predict exactly when or how we may die. But given a large enough population, insurance actuaries and underwriters are able to develop extremely accurate mortality tables which reliably predict the probability of death, with refinements for age, gender, state of health, and indulgences for risky activities. The larger the group exposed to an insurable risk, the more accurate will be predictions of the incidence of loss for that risk. Life insurers and liability insurers make decisions whether to issue a policy and the amount of premium to charge based on such statistical analyses of probability based on the law of large numbers.

Liability insurers may apply the law of large numbers to claims management as well as underwriting. Every year, a very large number of claims are made throughout the nation for coverage under liability policies. Regulations require liability insurers to deny, accept in full, or accept in part claims for defense and indemnification. Liability insurers decisions may be proper or wrongful. If an insurer denies a sufficiently large number of claims, it may track how denied claims develop and are resolved. The insurer can analyze the cost of wrongfully denied claims with the cost of defense and settlement of accepted claims to accurately predict the profitability of wrongfully denying claims. Using the law of large numbers, insurers can accurately predict the probability that a policyholder will respond to a wrongful denial of a claim and the ultimate cost of resolving the cost of wrongfully denied claims. From such statistics, the insurer may reliably predict whether a practice of wrongfully denying a defense produces a monetary savings. Simply put, liability insurers can use the law of large numbers to determine whether deliberately committing bad faith turns a profit or loss.