The Law of Small Numbers

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Abstract

The behavior economics, based on the discoveries to correct and complete the models of economics, has changed from a trend of thoughts to a part of the empirical field of economics after decades of development. Meanwhile, the Law of Small Numbers, a vital theorem in behavioral economics, serves as a vehicle for economists to complement the rational decision-making model and plays an essential function. This research paper is written to gain a better understanding of the Law of Small Numbers, in addition to introducing and analyzing its practical usage and applications, thus boosting the absorption and consolidation of knowledge. Due to unconsciousness, the Law of Small Numbers user cannot realize that their decisions are actually blind. In the meantime, people are prone to make up the relationship between two irrelevant facts, thus firmly believing their conclusions or predictions without the consciousness that their reasonings are incorrect.

Keywords: Behavior economics, Small Numbers, irrelevant, predictions, reasonings

I. Introduction

Currently, the Law of Small Numbers has become an essential law in the field of behavioral economics, thus encouraging researchers to study and apply the law. Since behavior economics, with a rising status, has enjoyed a priority after the Great Depression in 2008, the Law of Small Numbers can cater to the needs of economists to interpret modern societies.

The Law of Small Numbers, summarized based on the Law of Large Numbers, can provide us with a framework and a chance to understand human beings, just like the Law of Large Numbers.

This research aims to primarily understand the Law of Small Numbers and summarize its applications to prepare for further study into behavioral economics. The research paper consists of five main parts: an abstract, introduction, detailed analyses, applications, and conclusion. The third and the fourth main sections can be divided into three portions separately. The main parts of the study are three applications of the law. The first application summarizes how a marketing investigation shows the law, including the basic logic of using the law mistakenly and the emphasis on large samples. The second application, buying and selling strategies, reveals that sellers and buyers are apt to fall into the trap of the law from two different perspectives. The third application is insurance selling, the most typical utilization of the law.

2. Detailed analyses

A. What is the Law of Small Numbers

Generally speaking, the Law of Small Numbers reveals that people are prone to ignore the difference in accuracy between a larger number of samples and a small number of samples due to their intuitions.

The law was summarized by Amos Tversky and Daniel Kahneman (1982) and Terrell (1994) based on Gambler's Fallacy, utilizing knowledge including psychology and economics. (The Gambler's Fallacy is a mistaken belief about sequences of random events generated from the incorrect interpretation of the Law of Large Numbers. The investigators believe the Law of the Large Numbers can be employed for large and small samples. Tversky and Kahneman thus nicknamed the Gambler's Fallacy "the Law of Small Numbers")

Another law, the Law of Large Numbers, is required to gain a better understanding. It is obvious that compared to an experiment with a smaller sample size, a larger number of samples in a study will contribute to a much more precise experiment result. The large sample size is more precise than the small one. In other words, extreme test results appear more frequently in small samples rather than in large samples.

The Law of the Small Numbers refers to the tendency or incorrect belief of applying the rules or conclusions from large to small samples. For example, when flipping a coin, the possibilities of landing on heads or tails are equal (0.5). However, people are apt to consider the likeliness of landing on heads much lower if the coin has landed on heads many times. Admittedly, there is a slim chance of flipping a coin and keeping it landing on heads. But, the last result of landing, whether on heads or tails, has no impact on the following results.

Another point underlined is the discovery of Professor

Daniel Kahneman: System 1(the system giving quick response and reaction) is fond of reasoning out the relationship between the facts and experiment data or results, despite the contradiction between the conclusions it comes to. Back to the coin, believing that invisible relationships exist between each result is prevalent. System 1 is not able to tell whether the information is reliable or not. It tends to believe the information and makeup facts to convince ourselves, while System 2 works in the opposite method.

Intuitions are weak in dealing with complicated numbers, thus resulting in a poor understanding of the effects of sample size. People tend to neglect the role that the sample size plays. According to Professor Daniel Kahneman, for system 1 (the system giving quick and instant response), there is no difference between an experiment with 200 samples and one with 20000 samples. Meanwhile, questions are replaced with trust when the results are displayed. Attention is paid to the information itself instead of its reliability.

B. The definition of the Law of Small Numbers

The exaggerated faith in small samples is only one example of a more general illusion—we pay more attention to the content of messages than to information about their reliability, and as a result, end up with a view of the world around us that is simpler and more coherent than the data justify. Jumping to conclusions is a safer sport in the world of our imagination than it is in reality. Statistics produce many observations that appear to beg for causal explanations but do not lend themselves to such explanations. Many facts of the world are due to chance, including accidents of sampling. Causal explanations of chance events are inevitably wrong" (Kahneman 118).

C. The importance of studying the Law of Small Numbers

Entwined with the new decade is the prevalent bias that human behaviors are all based on sanity or personal will. Increasing attention is paid to the effect of our consciousness. However, the neglect of unconsciousness and intuition has brought about a narrow understanding of our actions, thus contributing to more misinterpretations of today's society and financial laws. The impact of unconsciousness should be emphasized, just like the consciousness.

On the one hand, learning about the Law of Small Numbers can serve as a platform to perceive and inspect our thinking process and practical actions. Human brains are adept at drawing conclusions and summarizing, while our brains are prone to discovering the rules that never exist, leading to the inexact methodology. Studying the Law of Small Numbers will be conducive to breaking the prejudice, thus steering clear of the possibility of being led astray in the complicated explanation. Studying the law can also be an excellent starting point for learning behavioral economics.

On the other hand, the Law of Small Numbers has the potential to be fully utilized, as the law has been shown and proven to have a wide range of applications in various fields. The incorrect usage of unconsciousness will be avoided to a certain extent with further interpretations and usage of the law. With a detailed interpretation of the law, telling the trap and explaining the reasons behind the semblance is convenient. It is conceivable that wrong predictions of the stock market can be changed. The misleading news or experiment results can be distinguished.

4. Applications

A. Management and future decision making

An incorrect analysis of a marketing investigation may lead to a mistake in cognition of the current circumstance. While the analysis is a significant factor in decision-making, a misleading choice can be ascribed to the Law of Small Numbers.

A case explained the law very well. A leader of a retail trading company required a consultant to investigate all the theft cases in 1000 branch stores. The consultant reported that among the 100 branch stores where theft cases happened frequently, most branch stores were located in rural areas, according to the percentage of turnover.

After a moment of silence and surprise, the treasurer announced that it was vital to install security systems in the rural branch stores immediately. He steadfastly believed that there was no other reason.

The description of the consultant will be accurate as long as the data is reliable. However, it does not represent that the treasurer's decision was correct. If the consultant had investigated the branch stores where theft cases rarely occurred, he would have found that most of these stores were still in rural areas.

The conclusions were contradictory since the leading factor was the scale of stores rather than areas.

If the leader and treasurer require a much more reliable investigation result, many samples are necessary. No matter the consultant's method, the conclusion would be misleading due to the small-scaled samples.

B. Selling and buying strategies

The Law of Small Numbers is universally reflected in

daily life and economic fields.

Assuming that an owner of a store has earned high praise for his first product sold last week. In this situation, the owner would firmly consider that every product in his store would be highly praised. Then, the owner gave up asking other customers for additional comments or suggestions and no longer tended to do a market investigation. Apparently, the owner had fallen into the Law of Small Numbers trap, thus giving rise to a poor reputation and his later failure.

Doing exactly the opposite, the law may benefit the sales volume. In other words, sellers can use the law to acquire profits. The consumers are subject to be influenced by the public opinion. For instance, clients are prone to purchase many products to prevent disasters when the latest accidents and natural disasters are reported more frequently. Extreme weather or catastrophes cannot be simply attributed to areas and locations. Only a few cases of accidents cannot explain or prove the overall circumstances. However, clients unconsciously believe that disasters occur more frequently in their area when they hear the news.

C. Insurance sales

The law of Small Numbers serves as a vehicle for the insurance company to make more profits. After analyzing the profit model of the insurance companies, it is noticeable that both the Law of Large Numbers and the Law of Small Numbers are utilized.

Whether the individual will come across an accident when taking a plane is unpredictable. The salesmen will convince the customers there would be compensation if a plane crash happened. They may take the one who has purchased the insurance and been compensated for masses of money as an example. Then, the client will mistake the individual cases for a universal situation, thus determining to purchase the insurance.

However, looking from an overall perspective, the frequency of plane accidents is around 1/5300000 annually. This means among all the 5300000 clients purchasing the insurance, merely one buyer should be compensated. The insurance company will calculate the per capita fees according to the rate, thus guaranteeing its stable profits.

Under no circumstances would the salesmen mention the actual rate of plane crashes. The clients rarely notice the chance and frequency. In contrast, the compensation and additional merits ares paid attention to. In all probability, there is neither an air crash during the trip nor a large amount of compensation.

It is discernible that the law of large numbers is utilized in profiting strategies, while the law of small numbers is adopted when clients purchase insurance.

5. Conclusion

In conclusion, the Law of Small Numbers comes from personal life experience, which cannot be transformed or shifted effortlessly. Following the Law of Small Numbers on significant occasions, the loss outweighs the gains.

This study aimed to understand the Law of Small Numbers primarily and summarize its applications to prepare for further study into behavioral economics. Meanwhile, the paper interprets and summarizes the reasons for the applications and behaviors, emphasizing studying unconsciousness and intuition. This work may offer a better understanding of interactions between psychology and economicseconomics and also providea strategy for combining multiple interactions, which can be applied to other systems

A limitation of the study is that more innovations are required. Being limited to the knowledge itself, this study lacks multiple perspectives. Not to mention that several questions remain to be answered. More broadly, research is also needed to determine the actual performance of law in life.

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