The Utilization of Present Bias Based on Bounded Rationality

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Abstract: 'Rational people' hypothesis is always regarded as the foundation of current economy although there are many limitations. After the improvement made by many scientists, Herbert Simon proposed the theory of bounded rationality. Based on that, prospect theory was developed to replace the expected utility which was built on 'rational people' hypothesis. Prospect theory itself is the basic theory of behavioural economics, and also the first theory to make researches on economics from psychology. It is under that condition that the present bias, related to hyperbolic discounting, was built. Present bias reveals that people prefer immediate advantages to future advantages during a short period, and such preference would fall rapidly. After that the paper show some utilization of present bias, especially in political and economic fields. Last but not least, there are also some methods introducing how to use or prevent present bias.

1. Introduction

The theory 'rational people' was proposed by Adam Smith, who believed that everyone is self-interested, which means people try to gain the greatest economic benefit at the smallest economic cost. Many neoclassical economists continued his theory and made something corrected and supplemented: Firstly, originally, 'rational economic man' was regarded as the result of the behavioral motive that people pursue their individual benefit and avoid lost, which was converted into the science including psychological pattern and selection decisions, which means that the principle of the actions of 'rational economic people' is to pursue the optimized economic results. Then the concept was used to describe the mutually connected group from just an individual, and such groups can promote the social benefit through pursuing individual benefit. After that, mathematical tools were used to the analysis of the actions of 'rational economic people', so that the dynamic economic relationships can be calculated and predicted. Generally speaking, the actions of 'rational economic people' were enlarged to every interconnected market from sole market, were expanded to general equilibrium from partial equilibrium, and increased to dynamic equilibrium from static equilibrium. Finally, Pareto proposed Pareto Optimality which reveals how to realize the unification of individual benefit and social benefit in the pursuit of individual benefit.

It is shown that economists had built the neoclassical economics system on the basis of 'rational people' hypothesis and 'maximization' principle. The new system is a precise analytical science which can lead to the certain conclusion and laws, which makes the logical deduction in economic analysis available.

In recent years, many winners of Nobel Prize in economics have developed 'rational people' hypothesis, which are shown in five aspects: Firstly, the Life cycle hypothesis proposed by Modigliani and Permanent income hypothesis proposed by Friedman enlarged the consumers' utility from short-term and static one to the long-term and dynamic one, which shows that consumers would take short-term income, long-term expected income and cost into consideration at the same time, so as to set consumption decision[1]. Then traditional economics neglect the researches on information itself because individuals are regarded as being in possession of complete information and there is no cost to find it. At that time, Coase proposed Transaction Costs, considering other factors like incomplete information [2]. Secondly, James Mirrlees, William Vickrey, George A. Akerlof, Andrew Michael Spence, Joseph Eugene Stiglitz, all of them have their own achievement on information, which further clarify the secret of economic occurrence [3-6]. Thirdly, the detailed methods to realize the aim of 'rational people' have been established to pursue the 'satisfying' result instead of maximized utility. Not only about goods, the choices also include the interpersonal gamble. Game Theory has been the topic of Nobel Prize in economics many times thanks to its profundity and extensiveness. The achievement made by John Nash, John C. Harsanyi, Reinhard Selten, Thomas C. Schelling, Eric S. Maskin, Roger B. Myerson, Leonid Hurwicz can all be included to detailed methods of realizing the target of 'rational people' [7-11]. Fourthly, Daniel Kahneman and Vernon Smith combined psychology and economics to study how to make decision under uncertainty, and they even invented a whole set of experimental research methods, which made everyone in economic field begin to reconsider the hypotheses on rational people proposed before and their theories were more suitable to real world[12,13]. Last but not least, the usage is expanded. On the basis of that economic behaviors can be featured by 'rational people', the hypothesis has been generalized to the behavioral analysis of various fields like political, legal, institutional, social, etc. For instance, Gary Stanley Becker found that such a hypothesis can be used to explain social behavior like education, marriage and racial discrimination [14]. Robert W. Fogel explained the emergent development history of current America through the hypothesis [15]. Oliver Eaton Williamson made excellent analysis on the management of economy via adding social factors into the hypothesis.

However, there is still some limitation of 'rational people' hypothesis, and the totally rational people almost cannot be found in actual world. When people take part in economic activities, they show not only the selfishness, but also the sociality, ethicality and the sense of organization, but all these factors are not taken into the consideration in the hypothesis. In addition, as the hypothesis was just based on the researches about economic efficiency, the economics cannot deal with the problem about how to strike a balance between efficiency and fairness due to the lack of fair allocation of limited resources in society. Meanwhile, the hypothesis is also limited objectively. As mentioned before, many people suffer from asymmetric information and the high cost to get it, so objectively speaking, it is hard for persons to compare costs with output totally during their economic activities, then the hypothesis cannot be realized completely.

In the circumstances, Herbert Simon proposed the concept of bounded rationality, which means that the actual action of human beings is limited by rationalism of subject and organization, so people should pursue the satisfying targets rather than the maximized ones. Affected by both subjective and objective reasons, a decision-maker have to ask just for bounded rationality instead of total rationality. They tend to be satisfied with just the simplest method and finish tasks with experience and laws [16].

2. Prospect Theory and Behavioural Economics

The prospect theory is an economics theory developed by Daniel Kahneman and Amos Tversky in 1979[14]. As the expected utility was based on the 'rational people' hypothesis, so there are some factors outside the consideration of economists. Then as a result, prospect theory was proposed, a time-inconsistent model, which can explain the violation of the advantage principle with the subjectively weighted utility. There are two main parts mentioned in prospect theory, one is value function, while the other is weighting function.

Firstly, the value function seems like an asymmetric "S", which means that people behave differently when there is the same amount of potential loss or gain. Thus, people need something to define loss or gain, so the specific situation is called the reference point. Moreover, for the same amount of loss and gains, it is always believed that the value of loss people suffer from is always larger than the actual loss value, while the situation is completely adverse in gain domain, in which people feel less valuable about their gain than actual. Therefore, there is risk-aversion in gain domain, but risk-seeking in loss domain.

Then, weighting function, which shows the sense of likelihood, and the decision weight will be given with each outcome. Only when facing the events that are totally impossible or certain can people judge it correctly. When there is just little possibility, people tend to be overreacted. Taking insurance as an example, the reason why people want to buy it is just to reduce their risk when the event happens although the possibility of the event is just only 1%. On the contrary, when it comes to some events with high probability, people tend to be underreacted.

Therefore, the main idea of prospect theory is clear: individuals are risk-averse when facing a risky choice leading to gains, and risk-seeking when facing a risky choice leading to loss. Plus, the judgement whether it gains or losses depends on the reference point [17].

The prospect theory is the founding theory of behavioural economics, and it shaped some experimental methods used to build a new economic theory. Furthermore, it was the first theory to make researches on economics from psychology, which means significantly to all the people in the future.

3. The Definition and Utilization of Present-Bias

3.1. Instant Fulfillment, but No Delayed Gratification

Before the term present-bias being introduced, the core idea of immediate gratification was already addressed in Ancient Greece, procrastination, an eternal topic for human.

Present bias is the tendency to rather settle for a smaller present reward than to wait for a larger future reward, in a trade-off situation. However, this trend was reversed when the rewards are equally delayed. Based on the bounded rationality, it describes the trend of overvaluing immediate rewards, while putting less worth in long-term consequences [18].

In the field of behavioral economics, present bias is related to hyperbolic discounting, which differs in time consistency.

As delayed, the consequences must be anticipated and discounted, like reweighted to take the delay into account. Humans are said to discount the value of the later reward, by a factor that increases with the length of delay. In the financial world, this process is normally modeled in the form of exponential discounting, a time-consistent model of discounting [19].

However, there is the time preference, which means the current relative valuation placed on receiving a good at an earlier date compared with receiving it at a later date. It is also shown

mathematically in the discount function: the higher the time preference, the higher the discount placed on returns receivable or costs payable in the future. Therefore, time preference was indeed not consistent, but inconsistent.

Then as a time-inconsistent model of delay discounting, hyperbolic discounting was stated, which is an alternative mathematical model that agrees more closely with these findings.

Hyperbolic discounting is mathematically described as $g(D)=1/(1+kD)$. Where $g(D)$ is the discount factor that multiplies the value of the reward, D is the delay in the reward, and k is a parameter governing the degree of discounting [20]. People may make different choices at different time points, according to the time span before getting money back. To understand it clearly, we assume that k=1. If, for example, Tom can get \$60 now or ＄100 after one year. Then D means the number of years of delay.

When D=1, $g(D)*100=1/(1+1)*100=50$, which means one year later, the value of such a reward just equals to ＄50, which is just a half of ＄100. Therefore, everyone will naturally choose \$100.

However, if Tom can get \$60 after one year or ＄100 after two years. Suppose that there is just one year left, $g(2)/g(1)*100=(1/3)/(1/2)*100=66.67$, which is higher than \$60. Hence people will choose to get \$100 after two years.

So, people prefer immediate advantages to future advantages during a short period, and such preference would fall rapidly. To be more detailed, the more the rewards are in the future, the less it falls. Individuals reveal a strong tendency to make choices that are inconsistent over time via hyperbolic discounting, which means they make the choices today that they prefer may not be the same as the one they would choose in the future, despite knowing the same information.

3.2. The Utilization of Present Bias

The term itself was coined in the second half of the 20th century. After that, it has been applied in many different fields. Here we will mention some examples in political and economic fields.

In the political election, as the present bias is characterized by an immediate effort, people may pay more attention to the short-term politic target which seems to meet the instant need of the people rather than the candidate who just outline the marvellous prospective. So, compared with those who pay more attention to the efforts made to strive for the target in long term, the people who can set a more attractive short-term target are more likely to be a leader. Therefore, the present bias may lead to a tremendous impact that the candidate who wins the election could fail to fulfil the people's expectations in long run.

In economic field, some financial institutions provide various kinds of products for their customers. Some of these products are in the form of loan, like Ant Credit Pay, which is extremely popular in recent years, provide customers with the chances of spending before repaying. By loaning and paying by instalments, customers can realize pre-expenditure so that they can afford the goods above their economic ability. When paying for goods, it is the common phenomenon that customers may just immerse themselves into current happiness and forget the truth that they have to repay it in next few months. Moreover, there are also a lot of people who would like to delay their repayment until the last interest-free day as late as possible as the result of that comparing with repay directly, owners would prefer to keep money in some related financial product, as they can benefit from a little interest.

4. Conclusions

From the present bias, we can naturally come to the conclusion that compared with delayed gratification, people prefer to enjoy the instant fulfillment. Based on the bounded rationality, the hyperbolic discounting is introduced to analyze the actual situation, which is mathematically described as g(D)=1/(1+kD).

Generally speaking, present-bias has both positive and negative influence on the society as a whole, including individuals, corporations and even the whole government.

For individuals, it is procrastination that has troubled lots of people. It is a common human experience to avoid doing the task that has to be finished before the deadline, which may even cause the decline of self-esteem. Especially for those who feel regretful, guilty and stressful, they should make their greatest effort to get rid of procrastination. Habits are recognized as the best defender for us to deal with it. Only when you are used to doing the same thing at a fixed period of time can you overcome the laziness well. Certainly, there are some other methods, for instance, timetables are ideal choices for them since they can realize all the deadline in time and organize their time better. Plus, some apps like tomato which can stop persons from playing smart phones also help, as persons will not be attracted by the news or games during their work time.

For corporations, especially in financial industry, they can get benefit through introducing projects to consumers. For example, persons may prefer to buy the things they want once they look at them rather than saving enough money for it, so corporations can provide some short-term debt for their customers with low interest, which would be extraordinarily attractive. However, for the mangers with present-bias, they may choose to invest in the short-run portfolio with great return rate instead of the long-run one with higher return.

Last but not least, for government, as mentioned before, the present bias probably leads to the useless election, which means the candidate may fail to meet the expectation of the people for the long term. To address that, the monitoring system must work in time, so it can be considered that the leader of the monitoring department or other vital but unique department like Federal Reserve System, should be chosen from another party so that they can have their own idea which sometimes is different from the president's.

Although the present bias is too hard for all the people to deal with at once, there is still something to do to improve the situation. The most essential thing is that, the present bias should be recognized at first, and that is why we need the behavioural economics.

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