Diminishing Utility, Loss Aversion, and Framing Effect in Financial Decission Making

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Abstract

This paper shows the effect of individual characteristics to individual's disposition to experience diminishing utility and loss aversion during decission making process according to Prospect Theory. Participants of this study are undergraduate students in an Indonesian private university. Individual characteristics studied are GPA, semester level, wheter participant is majoring in economic, sex, and whether participant has ever taken statistic subject. The level of diminishing utility and loss aversion is measured by asking participants to assign values to gambles with various outcomes and odds. The assigned values are then plotted to Utility-Value function according to Prospect Theory using MyCurveFit software. Level of diminishing utility and loss aversion of each participant can then be calculated. It is found that GPA is positively while semester level is negatively related to level of diminishing utility both in profit and loss situation. Major has no effect to diminishing utility. Female participants show bigger effect of diminishing utility compared to male participants. Statistic subject makes no difference on level of diminishing utility. For level of loss aversion effect, only statistic subject makes any significant effect to participants.

Keywords: Prospect Theory, Diminishing Utility, Loss Aversion, Decission Making, Risky Choice

1. Introduction

Classical theory in the decision-making assumes that human beings are always behave rationally. In its rationality, when faced with two options which the outcome is uncertain, an individual will make a choice in a way that maximizes the utility. The early theory that describes how humans behave when faced with risky chocie is Expected Utility Theory (EUT) as proposed by Neumann and Morgenstern (1944). EUT has been widely used as the basis of economic theory (Schoemaker 1982; Starmer 2000)

Many find that people do not follow the Expected Utility Theory in making a choice. Allais (1953) in Elsberg (1956) found what is called Allais Paradox where Expected Utility Theory is unable to explain how human makes a choice. Elsberg (1956) found numerous cases where axioms of Expected Utility Theory is not met.

In the late 70s Kahneman and Tversky found that decision-making by humans is not only based on utility maximization (Kahneman & Tversky, 1979). In making a decision, people are also influenced by psychological factors. The influence of psychological factors emerge in the form of loss aversion and framing effects (Tversky & Kahneman, 1981). The influence of psychological factors is demonstrated empirically, and cannot be explained by previous theories that consider humans are entirely rational in making decisions. Kahneman and Tversky's was awarded the Nobel prize in economics in 2002 for their finding. Prospect Theory soon became the foundation of a new branch of economy, namely behavioral economy.

Prospect Theory has been used to explain various anomalies that are otherwise difficult to explain. For example Grinblat and Han (2005) describes the phenomenon of Return Momentum in the stock investment as a result of Reflection Effect in Prospect Theory. Weber and Camerer (1998) demonstrated through laboratory experiments that the Disposition Effect in stock trading is in line with Prospect Theory. Shlomo and Thaler (1995) found that the Equity Premium Puzzle can be explained by Loss Aversion Effect in Prospect Theory. Camerer et al. (1997) explained the odd behavior of New York taxi drivers that work shorter time during peak hours using reflection effect and loss aversion effect of Prospect Theory. Hardie et al. (1993) explained higher price elasticity when price is increased compared to when price is decreased using loss aversion effect.

The main difference between the Expected Utility Theory and Prospect Theory is on the usage of reference point in Prospect Theory. An individual will compare his/her situation with a reference point, and then assess whether he/she is experiencing profit or losses (Kahneman and Tversky 1979). It was found that humans behave differently on the state of the profit and loss situation. Thus Prospect Theory has 2 domains, namely the domain of gains and domain of losses. Differences in the two domains of human behavior gave rise to a psychological effect that makes people sometime become irrational in taking a decision on a risky choice.

Prospect Theory suggests the following three things in describing human behavior when it took a decision on the selection of risk:

a) Diminishing utility in the state of profit: more profit will result in higher utility in smaller and smaller scale

b) Diminishing utility in the state of loss: more loss will result in lower utility in smaller and smaller scale

c) Loss aversion: Losses results in greater suffering than the level of satisfaction generated by a gain by

the same amount.

In Prospect Theory, the relation between utility and the value of gain or loss can be described in the following equation:

$$v(x) := \begin{cases} x^{\alpha}, & x \geq 0 \\ -\lambda(-x)^{\beta}, & x < 0, \end{cases}$$

With v(x) is utility, x is value of gain, (-x) is value of loss, α is diminishing utility factor in gain domain, β is diminishing utility factor in loss domain, and λ is loss aversion factor. λ and β has value between 0 and 1 with lower value corresponds to higher level of diminishing utility. λ has value greater than 1 with greater value corresponds to higher level of loss aversion.

2. Methodology

The method of this study follow Rieger et al. (2011). The level of diminishing utility and loss aversion of participants are measured by asking participants to assign values to gambles with various outcomes and odds. The value assigned by participants for each gamble is assumed to be proxy of utility they get from that particular gamble. The expected value of the gamble's outcome is the value in gain or loss domain. The assigned values are then plotted against gmble's expected value according to Prospect Theory equation using MyCurveFit software. Level of diminishing utility (α and β) and loss aversion (λ) of each participant are then calculated and regressed against individual characteristics. There are 8 questions to measure λ, 8 questions to measure β, and 4 questions to measure λ.

Below are sample of questionaire questions
1. 95% probability you do not get anything
   5% probability you get Rp.500,000 (five hundred thousand rupiah)
   How many Rupiah maximum amount you are willing to pay to take the bet?
2. 40% probability you do not get anything
   60% probability you get Rp.10,000 (ten thousand rupiah)
   How many Rupiah maximum amount you are willing to pay to take a bet ?
3. 90% probability you do not get anything
   10% probability you get Rp.50,000 (fifty thousand rupiah)
   How many Rupiah maximum amount you are willing to pay to take the bet?

3. Result and Discussion

Relation between GPA, semester level, whether participant majoring in economics, sex, and whether participant has ever taken statistic subject and λ, β, and λ are as follow.

Regression Result

	α	β	λ
Major	-1.906 (0.060)	1.626 (0.107)	1.236 (0.22)
GPA	-1.974 (0.049)*	-2.157 (0.034)*	0.377 (0.707)
Trimester	2.033 (0.045)*	2.658 (0.009)*	-0.773 (0.442)

* significant to 5%

Mean Comparison Result

	α	β	λ
Male	0.944	0.684	2.560
Female	0.912 (0.003)*	0.617 (0.048)*	2.551 (0.977)
Statistic Subject	0.932	0.675	2.706
No Statistic Subject	0.918 (0.286)	0.633 (0.407)	1.831 (0.002)*

* significant to 5%

α is negatively affected by the GPA, is positively influenced by the level of semester, and is unaffected by whether participant majoring in economics. This means the higher the GPA of participant, the more a prticipant is affected by diminishing utility in gain domain. Conversely, the higher the level of the participants semester level, the smaller the effect of diminishing utility in gain domain. No effect of major to the magnitude

of diminishing utility in gain domain.

Male participants showed an average α higher than female participants. This means women are more affected by the effect of diminishing utility in gain domain. There were no differences in the level of diminishing utility in gain domain between the participants that have or have not taken statistic subject.

An exactly same results are found for β. Thus the effect of GPA, semester level, major, sex, and whether participant has ever taken statistic subject to diminishing return are same for both gain domain and loss domain.

λ is not affected by the majors, GPA, and the level of semester. This means the effect of loss aversion participants are not determined by the majors, GPA, and the level trimester. There was no difference between the average λ male participants with female participants. But participants who had received a course in statistics show the average λ higher than the participants who did not receive statistics course.

5. Conclusion

This study shows that level diminishing utility and loss aversion are affected by individual characteristics. Further study can link the individual characteristics to behavior that come from diminishing utility and loss aversion such as risk aversion level and reflection effect.

References

Benartzi, S., & Thaler, R. H. (1995). Myopic loss aversion and the equity premium puzzle. Quarterly Journal of Economics, 110: 73-92

Camerer, C., Babcock, L., Loewenstein, G., & Thaler, R. (1997). Labor supply of New York City cabdrivers: One day at a time. The Quarterly Journal of Economics, 407-441.

Cicchetti, C. J., & Dubin, J. A. (1994). A microeconometric analysis of risk aversion and the decision to self-insure. Journal of political Economy, 169-186.

Ellsberg, D. (1956), Classic and Current Notions of "Measurable Utility ", Economic Journal,64, 528-556.

Grinblatt, M., & Han, B. (2005). Prospect theory, mental accounting, and momentum. Journal of financial economics, 78(2), 311-339.

Hardie, B. G., Johnson, E. J., & Fader, P. S. (1993). Modeling loss aversion and reference dependence effects on brand choice. Marketing science, 12(4), 378-394.

Kahneman, D. dan Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. Econometrica, 47(2), 263-292.

Rieger , M. O., M. Wang, & T. Hens (2011): \Prospect Theory around the World."Discussion Papers 2011/19, Department of Finance and Management Science, Norwegian School of Economics

Schoemaker, P. J. H. (1982) The Expected Utility Model: Its Variants, Purposes, Evidence and Limitations. Journal of Economic Literature, Vol. 20, No. 2, pp. 529-563

Starmer, C. (2000). Developments in non-expected utility theory: The hunt for a descriptive theory of choice under risk. Journal of economic literature, 38(2), 332-382.

Von Neumann, J. dan Morgenstern, O. (1944). The Theory of Games and Economic Behavior, 2nd ed. Princeton, NJ: Princeton University Press.

Weber, M., & Camerer, C. F. (1998). The disposition effect in securities trading: An experimental analysis. Journal of Economic Behavior & Organization, 33(2), 167-184.