



Utility Maximization vs Regret Minimization: Choice Behavior Under Uncertainty

Xiayu Jiao, PhD¹; Sander van Cranenburgh²; PhD, Ning Yan Gu, PhD³

¹University of Southern California, CA, USA; ²Delft University of Technology, The Netherlands; ³University of San Francisco, CA, USA



OBJECTIVES

- Traditionally, researchers extract latent coefficients using the conventional random utility maximization (RUM). Recently, a new model, the Random Regret Minimization (RRM) postulates that people making choices by minimizing the anticipated regret.
- More recently, μ RRM generalizes the RRM by introducing a scale factor (μ) in the regret function.
- This study aims to examine which decision-making theory better describes how people make decisions when faced with different levels of risks and survivals which are illustrated using the attributes and levels from EQ-5D-5L.

METHODS

- A discrete choice experiment (DCE) was designed with 6 attributes.
 - Five attributes from the EQ-5D-5L: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression
 - One attribute of out-of-pocket costs as % of annual household income (5%, 10%, 20% and 50%)
- Experimental design was conducted using Ngene.
 - 10 choice sets were designed.
 - Each choice set contained 3 alternatives.
 - One additional dominant choice set was included for the quality screening.
- Responses were collected from SurveyMonkey in December 2022.
- We used RUM, μ RRM and RRM models for the estimations.
- We estimated the extent of semi-compensatory behavior by the magnitude of μ in μ RRM:
 - $\mu \rightarrow \infty \Rightarrow$ fully compensatory behavior
 - $\mu \rightarrow 0 \Rightarrow$ strong semi-compensatory behavior

RESULTS

- A total of 90 (out of 150) respondents passed the screening and were included in the analysis, 54 failed to pass the test scenario and 6 respondents gave the same answers to every scenario.
- Mean age was 40.1 years (± 16.0), with 42.2% male, 71.1% white, 11.1% black, 90.0% completed college degree, most of them had health insurances at the time of survey including: commercial (45.6%), Medicare (15.6%), Medicaid (13.3%), and Affordable Care Act (6.7%).
- Estimated coefficients of all EQ-5D-5L items were significant in all three models (Table 2).
- The out-of-pocket cost also showed significance across models.
- Value of μ from the μ RRM was larger than 1 indicated that respondents were not showing semi-compensatory behavior while making decisions.
- The log-likelihood estimations were comparable across models suggested that these models had similar fittings to the data.

Table 2 Model outputs

	RUM model			μ RRM model			RRM model		
	Coef.	Std. Err.	P value	Coef.	Std. Err.	P value	Coef.	Std. Err.	P value
Mobility	-0.207	0.017	<0.001	-0.114	0.025	<0.001	-0.116	0.026	<0.001
Self-care	-0.183	0.017	<0.001	-0.116	0.020	<0.001	-0.118	0.021	<0.001
Usual activities	-0.141	0.017	<0.001	-0.076	0.019	<0.001	-0.078	0.019	<0.001
Pain/discomfort	-0.247	0.016	<0.001	-0.156	0.019	<0.001	-0.155	0.019	<0.001
Anxiety/depression	-0.195	0.017	<0.001	-0.090	0.023	<0.001	-0.089	0.023	<0.001
Out-of-pocket cost	-0.011	0.002	<0.001	-0.006	0.001	<0.001	-0.006	0.001	<0.001
μ	NA			153.5			1		
Final Log-likelihood	-935.5			-941.88			-942.62		

Table1 Characteristics of respondents

Characteristic	Respondents N=90
Age (Mean, SD, Min, Max)	40.1, 16.0, 19, 78
Sex	
Male	38 (42.2%)
Race	
White	64 (71.1%)
Black	10 (11.1%)
Other	16 (17.8%)
Ethnicity	
Spanish/Hispanic/Latino	20(22.2%)
Education	
Less than or equivalent to high school	9 (10.0%)
Bachelor’s degree	81 (90.0%)
Insurance type	
Private health insurance	41 (45.6%)
Medicare plan	14(15.6%)
Medicaid plan	12 (13.3%)
Other	6 (6.7%)
Self-pay	7 (7.8%)
None/Don’t know	10 (11.1%)

CONCLUSIONS

- Large scale parameter μ in this analysis suggested that respondents did not yield strong semi-compensatory behavior, which means random utility maximization (RUM) better describes choice behavior.

ACKNOWLEDGMENTS

This study was funded by the EuroQol Research Foundation: 358-RA