A study on consumption behaviors of each generation in Mongolia in transition countries: Behavioral economics approach about money illusion and consumption smoothing

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Abstract. In this research, the money illusion not only has arisen, but it was checked that a time preference rate is not constant. If it is consumed as the younger age group and a rate of time preference changes with generations, it will be thought that 1-dollar value changes with generations. That is, even if the loss of the same amount produces the younger age group and an old age layer, if it is the younger age group, a loss may also feel the loss by a money illusion small. That is, the time preference rate which affects consumption smoothing also affects a money illusion. The difference for every generation of a time preference rate becomes larger than the influence which only consumption smoothing has on people's economical action. It has a possibility of bringing a big difference to the economical action for every generation. If the preference of a between at the different time changes with generations, the consumer behaviors at a certain time not only differ for every generation, but it will be thought that the reactions to a loss also differ.

Keywords. Money illusion; Consumption smoothing; Mongolia.

JEL. P20; P22; P24.

1. Introduction

This paper is examine about consumption behavior in Mongolia in transition countries. Mongolia has moved from the socialist economy to market economy in 1990 twenty years ago. Market economy led to major changes in lifestyle. The effort is also likely to increase income. This paper consider whether such environments change make differences in labor awareness and consumer behaviors of each generation by using behavioral economics methods. I specially verify whether the changes of awareness has occurred bordering on teens when it has changed from a socialist economy to market economy in 1990. That is now 30's. Purpose is to examine whether market economy make differences in the awareness of each generation. This research verifies whether general economic is satisfied in transition countries, and whether the results of transition countries difference with that of development countries, especially in Japan. I consider two views based on survey of behavioral economics.

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Firstly, it is the existence of money illusion. Secondary, it is existence of the consumption smoothing is satisfied by estimating time reference rate of each generation. Products Prices is determined at market prices in market economy. The impact for deflation and inflation is more bigger in developing countries than that for development countries. So people need to consider such impact. Since socialist economy planned to produce products, the variation of monetary inflation and deflation is smaller. So people with experience of life in the socialist economy is less responsive to inflation and deflation. It considers that they can't recognize the real value and the nominal value. That means that they illusion for money.

Next, it had assumed that general economic was constant about time reference rate because people consume the changes from permanent consumption. But many products are imported from abroad in transition countries since introduction to market economy. It mainly stimulate young. And the socialist economy has a goal to distribute resources equally. So the state had ensured the life for elderly even as people become old age. So It might consider that thoughts about preparing for retirement also had changed according to introduction of market economy. It might reduce the consume when young, and increase the save. It might such circumstances made differences of each generation about time reference rate.

Camerer & Loewenstein (2004) shows the following three as a consumptive anomaly. Firstly, This is that man recognizes income not as a real value but as a nominal value. This is called a money illusion. According to standard economics, rational consumers consider worth of income from the amount of goods which can be purchased. Secondary, This is that man does not smooth consumption through the whole life. According to the life-cycle model drawn from standard economics, rational consumers should smooth consumption. Thirdly, This is that man also changes how to use if a source of income is different.

According to standard economics, rational consumers should regard it as the same income regardless of the source of income. As typical lliteratures of behavioral economics, there are Kahneman & Tversky (1979), Kahneman, Slovic, & Tversky (1982), Camerer, Lowenstein, & Rabin (2004), Altnam (2006) etc.

This section takes up the 1st anomaly, i.e., money illusion. Next section takes up the 3rd anomaly, i.e., consumption smoothing. A money illusion is making decisions not based on a real value but based on a nominal value, when people do economical action. The utility and benefits which people get are generated from goods, i.e., thing. So as for people, making decisions based on a real value is rational.

Although the real value and the nominal value have deviated, since making decisions based on a nominal value is contrary to economic rationality, it is called a money illusion.

2. Previous review about money illusion and consumption smoothing

About the money illusion is verified in Section 3, about 80 years ago, although the book of the title a"money illusion" was published, after that, Patinkin (1965) also takes up this problem and, as for Fisher (1928), the scholars of behavioral economics have taken up this problem in recent years.

The result of empirical study is supporting existence of a money illusion. For example, there is research of Shafir, Diamond & Tversky (1997) which investigated the virtual question in the United States, and Fehr & Tyran (2001) which conducted experiment investigation in Switzerland.

In this section, it verifies whether a money illusion is observed using micro data in transition country Mongolian.

It indicates that Kachelmeier & Shehata (1992) was not able to find out a difference although the result obtained from the virtual question was compared with the result obtained from the situation where the money incentive was given to the participant. So, it is thought that the result obtained from the virtual question also has validity.

About the money illusion is verified in Section 4, Rae (1834) considered that the choice between at different time consists of many psychological factors. But many people accepted the method which replace many factors to one parameter since Samuelson (1937) suggested the model which discounted utility. This meant that discount rate was used to many people. But it replaced to the discount of hyperbola type which Laibson (1997,1998) suggest so which did not have the good empirical results. But, Frederick, Loewenstein, & O'Donoghue (2002) says that the present consumption may be affected by the influence of past consumption. and the preference itself may change with formation of a new custom, or change of a reference point, or change of man's instinct. There is the following as criticism to the utility function which standard economics assumes. Simin (1986) says that the economist is using a word called rationality in the sense of a narrow sense extremely, and insists that he will eliminate many domains of the rational phenomenon which a psychologist includes therein as a result. And Frank (1987) says, If man's emotional side is taken into consideration in specification of a utility function, the range to which an economic model is applied is arguing that it can expand sharply. Tversky & Thaler (1990) says, in behavioral economics, value and a preference are made from a derivation process by people, and it is being argued that a preference stands on the position in which it is formed depending on the situation where the decision maker and the decision problem set. As research which presumed the state-dependent utility function, there is research of Viscusi & Evans (1990) or Evans & Viscusi (1991).

The early researcher think that it is difficult to think that a single parameter can show the factor of consumption distribution between a time and other time. This research should think that some parameter show the factor of consumption distribution between at the different time, without using a single parameter. Taking into consideration here is two of the

difference in the enjoyment capability of utility between generations and the residual effects of utility which produced at a time affects the utility of henceforth at that time. The model of this research rewrites the Euler equation which uses a rate of time preference. Time preference rate changes into the parameter that show the difference in the enjoyment capability of the utility between generations, and the parameter which shows the residual effect of the utility. In Mongolia, Investigation of the consumption distribution by generation during the whole life under the assumption which removes uncertainty (Ishii, 2012) shows the result that consumption distribution of youth is larger than that of old. This can explain the model of this research.

It is assumed that neo-classical economics model maximizes the utility that a household is obtained from consumption of each term through the future. This means solving dynamic optimization problem about a consumptive time series. A permanent income hypothesis indicates that consumption is decided by permanent income. The increase in income leads to the increase in consumptive in the range reflecting the increase in permanent income. When higher-income than permanent income, that means when fluctuating income is high, positive savings is performed, and savings is pulled down when low. People smooth a consumptive time path using savings and borrowing.

However, when presuming permanent income, there is a problem that the relation between the permanent income estimated and consumption is close to actual income and a consumptive relation since permanent income had a close relation with actual income, Therefore, it was difficult to distinguish a permanent income hypothesis from the Keynesian type consumption function. Then, by introducing a rational expectation hypothesis, the random walk hypothesis of consumption of Hall (1978) proposed the radical solution over this problem. Hall verified the hypothesis about the time series of the consumption theoretically drawn from a permanent income hypothesis and a rational expectation hypothesis instead of presuming the permanent income. He thought that the rational consumer can improve the utility by smoothing it, if a consumptive change is predicted. A rational individual adjusts consumption of his this term to the point that a consumptive change is no longer predicted. If an individual performs optimal consumption selection based on all the information which can be obtained at the time, consumption of a term will be set to 1/T of aggregate consumption expectable in the whole life T period. And consumption of the next term expected at each term is equal to consumption of this term. That is, it will be said that a consumptive change cannot be predicted and a consumptive random walk hypothesis is satisfied. The result of Hall could not have rejected the hypothesis that a consumptive change could not be predicted using lag value of income or the consumptive lag value as above-mentioned. However, it was criticized that his method cannot be interpreted unambiguously the obtained result. Campbell & Mankiw (1989) built the hypothesis that some consumers consumed all the present income in hand-to-mouth life, other consumers performed

consumption smoothing according to permanent income hypothesis. He estimated hand-to-mouth life consumers' percentage λ using instrumental variables method. They increased consumption by about 50 cents intentionally in response to the increase in income of 1 dollar expected. This means that a random walk hypothesis was rejected.

However, since the ratio of λ by Campbell and Mankiw is much smaller than 1 at about 0.5, Romer (2006) claims that a permanent income hypothesis is still important for a consumptive understanding. Although a random walk hypothesis is rejected in the research using macro data including Campbell and Mankiw in many cases, since the research using macro data was not persuasive enough, its research using the micro data obtained from the social experiment would be mainstream after the 90s. Shea (1995) showed that 1% of rise of the wages by a labor contract which can be predicted brought about the increase in 0.89% of consumption using micro data. Souleles (1999) showed that 35-60% of the tax rebates which can be predicted were consumed within a quarter. The research using the micro data shows that household consumption overreacts to change of the expected income (Flavin, 1981). That is, it is clear to react to change of the income which can predict consumption unlike the hypothesis of Hall, and a random walk hypothesis is rejected like the research findings using macro data.

From the above, it is clear that, the result of study of permanent income hypothesis which obtained using macro data and micro data is not satisfied strictly. Assumption which sets it as it is constant and use time preference rate of a single parameter is considered to be one of the causes as a factor of the consumption determination between a time and other time. There is a problem in assumption which time preference rate was constant, and I thought that time preference consists of various factors.

3. Money illusion

3.1. Sample

The attribute of the sample used in this section before analysis is checked. The data to be used is sex, age, a household annual income, and an inhabitable area. A man-and-woman ratio has a slightly high male ratio, although there is no deviation. Although it was made for the number of samples for every generation to turn into the same number mostly, a 40's ratio is slightly high.

The question of a questionnaire Please imagine that he is a salaried worker. Suppose that your salary and prices changed to six situations shown below in the past six months. You thought that you would buy a certain goods six months ago. When you set in six situations shown below, does the probability that you will buy this product change?

Please choose one from five choices. A choice is the following. 1 increases, 2 increases a little, 3 does not change, 4 is slightly low, 5 is low.

Situation 1: *The prices of all the goods including the goods currently regarded as your buying it in these six months are changeless, and your salary went up by 3%.*

Situation 2: *The prices of all the goods including the goods currently regarded as your buying it in these six months rose by 3%, and your salary went up by 6%.*

Situation 3: *The prices of all the goods including the goods currently regarded as your buying it in these six months fell 6%, and your salary fell 3%.*

Situation 4: *The prices of all the goods including the goods currently regarded as your buying it in these six months are changeless, and your salary was not changeful, either.*

Situation 5: *The prices of all the goods including the goods currently regarded as your buying it in these six months rose by 3%, and your salary also went up by 3%.*

Situation 6: *The prices of all the goods including the goods currently regarded as your buying it in these six months fell 3%, and your salary also fell 3%.*

Table 1. *The frequency table for every sex*

	Frequancy	Percent
Man	176	49
Woman	184	51
Total	360	100

Table 2. *The frequency table for every age*

Age	Frequancy	Percent
20-29	86	23.89
30-39	74	20.56
40-49	86	23.89
50-59	64	17.78
60-69	38	10.56
70-	12	3.33
Total	360	100

3.2. Result

3.2.1. Basic Statistics

3.2.1.1. The case for 3% rise of real salary

This section verifies the existence of a money illusion. The descriptive statistics of the reply to the question shown with Section 2 will be shown. Table 4 is the descriptive statistics about the reply of the question about a money illusion. Since a numerical value is the reply of five-step evaluation, the more a numerical value is high, the more decline in consumption probability is shown. If it checks by average value, consumption probability will fall in order of the situation 3, the situation 2, and the situation 1. The consumption probability of the situation 3 is smaller than other two. Table 5 is about the situation 1. The ratio of the replies "it does not change" is the largest, and a "slightly high" ratio is large to the next. It is the distribution which inclined toward the left. Table 6 is about the situation 2. Like the situation 1, although the ratio of "not changing" among replies is the largest,

a "slightly low" ratio is next large. Although the situation 2 resembles the situation 1, the reply is flowing in the direction in which consumption probability is reduced a little. Although a substantial situation does not change, it is thought that the respondent reacted to the rise of prices lowered consumption probability compared with the situation 1. Table 7 is about the situation 2. The ratio of the replies "it is low" and a "slightly low" ratio are the largest. Compared with the situations 1 and 2, the reply is flowing through the reply of the situation 3 in the direction in which consumption probability is reduced more. It is thought that the respondent reacted to the fall of the salary lowered consumption probability compared with the situation 1 or 2. Two of falls of the rise of prices and a salary can be considered as a factor which lowers consumption probability. Asymmetry is seen by these reactions and consumers are considered to react more sensitively to the fall of a salary rather than the rise of prices. Even if a real salary does not change, it will be thought that the psychology where he would like to avoid the fall of a nominal salary worked.

Table 3. *Household Income(unit: 100 thousands togrig)*

	Frequency	Percent	Accumulation (%)
～15	74	20.56	20.56
15～18	34	9.44	30
18～21	26	7.22	37.22
21～24	25	5.56	42.78
24～27	26	7.22	50
27～30	21	4.44	54.44
30～33	18	2.22	56.67
33～36	20	5.56	52.22
36～39	20	3.33	65.56
39～42	23	2.22	67.78
42～45	26	4.44	72.22
45～48	29	4.44	76.67
48～51	7	1.11	77.78
51～54	6	1.67	79.44
54～57	8	2.22	81.67
57～60	6	1.67	83.33
60～63	8	2.22	85.56
63～66	4	1.11	86.67
66～69	2	0.56	87.22
69～72	14	3.89	91.11
72～	32	8.89	100
Total	430	100	

Table 4. *Descriptive statistics of the reply about a money illusion: real income 3%up*

Variable	Case1	Case2	Case3
Obs	358	358	358
Mean	2.99	3.43	3.78
St.Dev.	1.20	0.99	1.01
Min.	1	1	1
Max.	5	5	5

Table 5. *The frequency table for every reply(Situation1):price 0%, income 3%up*

Case1	Freq.	Percent	Cum.
1	40	11.17	11.17
2	94	26.26	37.43
3	98	27.37	64.8
4	82	22.91	87.71
5	44	12.29	100
Total	358	100	

Table 6. *The frequency table for every reply(Situation2):price 3%up, income 6%up*

Case2	Freq.	Percent	Cum.
1	12	3.35	3.35
2	44	12.29	15.64
3	131	36.59	52.23
4	119	33.24	85.47
5	52	14.53	100
Total	358	100	

Table 7. *The frequency table for every reply(Situation3):price 6%down, income 3%down*

Case3	Freq.	Percent	Cum.
1	12	3.35	3.35
2	28	7.82	11.17
3	76	21.23	32.4
4	154	43.02	75.42
5	88	24.58	100
Total	358	100	

3.2.1.2. The case for 0%rise of real salary

Table 8 is the descriptive statistics of a reply of the question about three situations meaning a real salary not changing. If it sees by average value, consumption probability will fall in order of the situation 6, the situation 5, and the situation 4. The consumption probability of the situation 6 is smaller than other two. Table 9 is about the situation 4. The ratio of the replies "it does not change" is large, and a "slightly high" ratio is large to the next.

Table 8. *Descriptive statistics of the reply about a money illusion: real income 0%up*

Variable	Case4	Case5	Case6
Obs	358	358	358
Mean	2.95	3.12	3.53
St.Dev.	0.67	0.94	1.11
Min.	1	1	1
Max.	5	5	5

Table 9. *The frequency table for every reply(Situation4):price 0%, income 0%up*

Case4	Freq.	Percent	Cum.
1	6	1.68	1.68
2	56	15.64	17.32
3	262	73.18	90.5
4	18	5.03	95.53
5	16	4.47	100
Total	358	100	

Table 10. *The frequency table for every reply(Situation5):price 3%up, income 3%up*

Case5	Freq.	Percent	Cum.
1	14	3.91	3.91
2	46	12.85	16.76
3	230	64.25	81.01
4	18	5.03	86.03
5	50	13.97	100
Total	358	100	

Table 11. The frequency table for every reply(Situation6):price 3%down, income 3%down

Case6	Freq.	Percent	Cum.
1	12	3.35	3.35
2	32	8.94	12.29
3	176	49.16	61.45
4	30	8.38	69.83
5	108	30.17	100
Total	358	100	

Table 10 is about the situation 5. The same result as the situation 4 was obtained. Rather than the situation 4, the reply is flowing through the situation 5 in the direction in which consumption probability is reduced a little.

Table 11 is about the situation 6. Compared with the situations 4 and 5, the reply is flowing through the situation 6 in the direction which has many people who choose "it is low" and in which they reduce consumption probability. Although a substantial situation does not change, it is thought that the respondent reacted to the fall of the salary lowered consumption probability compared with the situation 4 or 5. The same result was obtained compared with the situation 1, the situation 2, and the situation 3.

3.3. Test of difference

If people are making decisions based on the real value, since three situations are substantially the same, there must be no difference between replies. In order to verify strictly whether a difference is between the replies under three situations, the statistical technique is used and it estimates test of a difference. Analysis in the case of regarding it as the case where a reply regards it as an interval scale, and an ordinal scale is conducted. When a reply regards it as an interval scale, analysis of variance of repetitive measurement is conducted, Since the reply in three situations is repetitive measurement by the same respondent, when regarding it as an ordinal scale, Friedman test is performed.

Firstly, the case where a reply regards it as an interval scale is considered. Before estimating the analysis of variance of Repeted measure, it is necessary to estimate Mauchly's test of sphericity. This test verifies whether the standard error of the average value between replies is equal. Although Table 12 shows the result, it is significant with the 5% level. Since this means that the standard error of the average value between replies is not equal, it should see the test results of Greenhouse-Geisser or Huynh-Feldt in an analysis-of-

variance table. Table 13 shows the test results of Greenhouse-Geisser and Huynh-Feldt. It is shown that both of the test results, Greenhouse-Geisser and Huynh-Feldt, is significant with the level 5%, and a reply has a difference among three situations.

Next, in order to find between which situations there is any difference among three situations, Table 14 is the result of test of the difference between two situations respectively. The Bonferroni method was used in this test. It indicates that Table14 has a difference significantly with the level 5% among all the situations. There is a difference between situations significantly and consumption probability is falling in order of the situations 3, 2, and 1.

Secondary, the case where a reply is regarded as an ordinal scale is considered. It estimates Friedman test which is the nonparametric estimation in the analysis of variance of repeted measure is performed. A nonparametric test has a merit which does not assume the normality of data. Table 15 was shown the result of Friedman test, there is a difference significantly with the level 5% among three situations. The multiple comparison of three situations is carried out by using the reply of two situations among three situations respectively like the above analysis of variance also here. Test used for the multiple comparison is the Wilcoxon rank test. Table16 –Table18 is shown this results. There is a point which it must be careful of in the interpretation as a result of the Wilcoxon rank test. Since it is testing whether a difference arises in a result with the combination of three situations, it is necessary to correct the significance level to the Bonferroni inequality. Since three situations will be used if 5% of a significance level is adopted, you have to correct the significance level to 0.0167 which divided 0.05 by 3. Table 16 - table 18 which corrected the significance level is shown it has a difference significantly with the level 5% among all the situations. This conclusion is the same as the result of the above analysis of variance.

Table 12. *Mauchly's test of sphericity: Case for real income 3% up*

		Situation repetition measurement
Machly's W		0.84
Approximation Chi square		62.237
Degree of freedom		2
Significant probability		0***
Epsilon	Greenhouse-Geisser	0.862
	Huynh-Feldt	0.866
	Minimum	0.5

Table 13. *The variance analysis of repeted measure: Case for real income 3% up*

		Sum of square	Degree of freedom	Men of square	F value	Significant probability
Between situation	Assumption of a surface of a sphere	63.709	2	31.855	40.691	0***
	Greenhouse-Geisser	63.709	1.725	36.964	40.691	0***
	Huynh-Feldt	63.709	1.731	36.802	40.691	0***
	Minimum	63.709	1	63.709	40.691	0***
Error (between situation)	Assumption of a surface of a sphere	558.957	714	0.783		
	Greenhouse-Geisser	558.957	615.307	0.908		
	Huynh-Feldt	558.957	618.015	0.904		
	Minimum	558.957	357	1.066		

Table 14. *Test of the difference between two situations: Case for real income 3%up*

(I) Situation	(J) Situation	The difference of average value (I-J)	Standard error	Significant probability
1	2	-0.173	0.054	0.001
	3	-0.581	0.065	0.000
2	1	0.173	0.054	0.001
	3	-0.408	0.077	0.000
3	1	0.581	0.065	0.000
	2	0.408	0.077	0.000

Table 15. *Friedman's test: : Case for real income 3%up*

Sample	358
Chi square	58.61
Degree of freedom	2
Asymptotic significant probbbility	0***

Table 16. *Wilcoxon rank test: (Situantion1 and 2)*

Z	-3.34
Asymptotic significant probbbility	0.001***

Table17. *Wilcoxon rank test: (Situantion1 and 3)*

Z	-8.121
Asymptotic significant probbbility	0.001***

Table 18. *Wilcoxon rank test: (Situantion2 and 3)*

Z	-5.169
Asymptotic significant probbbility	0.001***

Like the situations 1-3, if people are making decisions based on the real value, since three situations are substantially the same, there must be no difference between the replies of the situations 4-6. The statistical technique is used in order to verify strictly whether a difference is among three situations also here again. Firstly, The case where a reply regards it as an interval scale is considered. Table19 is the results of Mauchly's test of sphericity. It is significant with the 5% level.

Since this means that the standard error of the average value between replies is not equal, it should see the test results of Greenhouse-Geisser or Huynh-Feldt in an analysis-of-variance table. Table 20 shows the test results

of Greenhouse-Geisser and Huynh-Feldt. It is shown that both of the test results, Greenhouse-Geisser and Huynh-Feldt, is significant with the level 5%, and a reply has a difference among three situations. Next, In order to find between which situations there is any difference among three situations, Table 21 is the result of test of the difference between two situations respectively. It indicates that Table 21 has a difference significantly with the level 5% among all the situations. There is a difference between situations significantly and consumption probability is falling in order of the situations 3, 2, and 1.

Secondary, the case where a reply is regarded as an ordinal scale is considered. It estimate Table 22 was shown the result of Friedman test, there is a difference significantly with the level 5% among three situations. Test used for the multiple comparison is the Wilcoxon rank test. Table23 –Table25 is shown this results. Table 23 - Table 25 which corrected the significance level is shown it has a difference significantly with the level 5% among all the situations. This conclusion is the same as the result of the above analysis of variance.

Table 19. *Mauchly's test of sphericity: Case for real income 0%up*

		Situation repetition measurement
Machly's W		0.263
Approximation Chi square		475.292
Degree of freedom		2
Significant probability		0***
Epsilon	Greenhouse-Geisser	0.576
	Huynh-Feldt	0576
	Minimum	0.5

Table 20. *The variance analysis of repeted measure: Case for real income 0%up*

		Sum of square	Degree of freedom	Men of square	F value	Significant probability
Between situation	Assumption of a surface of a sphere	111.67	2	55.835	59.591	0***
	Greenhouse-Geisser	111.67	1.151	96.978	59.591	0***
	Huynh-Feldt	111.67	1.153	96.865	59.591	0***
	Minimum	111.67	1	111.67	59.591	0***
Error (between situation)	Assumption of a surface of a sphere	686.996	714	0.937		
	Greenhouse-Geisser	686.996	411.085	1.627		
	Huynh-Feldt	686.996	411.564	1.625		
	Minimum	686.996	357	1.874		

Table 21. *Test of the difference between two situations: Case for real income 0%up*

(I) Situation	(J) Situation	The difference of average value (I-J)	Standard error	Significant probability
1	2	-0.344	0.027	0.000
	3	-0.444	0.086	0.000
2	1	0.344	0.027	0.000
	3	-0.788	0.087	0.000
3	1	0.444	0.086	0.000
	2	0.788	0.087	0.000

Table 22. *Friedman's test: : Case for real income 0%up*

Sample	358
Chi square	104.648
Degree of freedom	2
Asymptotic significant probbbility	0***

Table 23. *Wilcoxon rank test: (Situantion4 and 5)*

Z	-10.497
Asymptotic significant probbbility	0.001***

Table 24. *Wilcoxon rank test: (Situantion4 and 6)*

Z	-4.964
Asymptotic significant probbbility	0.001***

Table 25. *Wilcoxon rank test: (Situantion5 and 6)*

Z	-8.104
Asymptotic significant probbbility	0.001***

In Section 3, in order to verify whether a money illusion is observed in transition country Mongolian, the virtual question about a consumer behavior was investigated for the man and woman of Ulaanbatar. A question was asked about six situations as a virtual question. I showed three situations where a real salary goes up by 3%, and three situations where a real salary did not change, and got the consumption probability under it to answer in five steps.

As the situation where a real salary goes up by 3%, It is a case where a salary goes up by 3% although, as for the 1st case, prices do not change. The 2nd case is a case where prices rise by 3% and a salary goes up by 6%. The 3rd case is a case where prices fall 6% and a salary falls 3%. As the situation where a real salary goes up by 0%, As for the 4th case, prices and a salary do not change. As for the 5th case, both prices and a salary go up by 3%. As for the 5th case, Both prices and a salary fall 3%. As for each situation of the three former, a real salary goes up by 3%, and each of three latter situations shows that a real salary does not change. If people do not have a money illusion and it is acting based on a real base, consumption probability should not change. However, according to the analysis conducted in this section, even when it was able to be considered that a reply is an interval scale, and even when it was able to be regarded as an ordinal scale, the significant difference was statistically seen by the reply obtained among each three situation, and existence of a money illusion was proved. And consumption probability fell in order of the order of the situations 3, 2, and 1, and the situations 6, 5, and 4. While both the situations 2 and 3 have maintained the rise of the real salary to 3%, in the situation 2, prices and a salary go up, but, Prices and a salary are falling in the situation 2. It is thought that, as for the former, the respondent reacted to the rise of prices lowered consumption probability, and, as for the latter, the respondent reacted to the fall of the salary lowered consumption probability. Asymmetry was checked by the respondent's reaction and it has reacted greatly due to the fall of a salary rather than the

rise of prices. It is thought that there is avoidant to a nominal wage falls. Unlike the usual economic variable, wages are the countervalues to labor of them and it can be considered that they are evaluation to themselves. Man believes that I am a worthy existence, and man is wishing he would like to accept so also from the surroundings. Since the fall of wages means deterioration of my value if it is right, it is hard to accept the fall of wages. Although Tsukahara (2003) pointed out "approval of the self-value as a human being who exists in society" as man's action motive, he is considered that such human psychology serves as a backdrop by avoidant [of a nominal wage fall].

As a problem before pursuing economic rationality, existing in society will be the requisite, and if man does not survive, he cannot pursue economic rationality. Man recognize that having a motive about survival of a human being with will is a subject which is worth being sufficient for he existing in society.

As political implication, even if real wages are constant, in the deflation situation where a nominal wage also falls, it is expected that consumption declines. When the government performs business stimulating measures, the policy operation which considered the trend of the nominal wage rather from real wages is needed.

The result of this section checked that the fall of a nominal wage made consumption decline. Probably, people are going to avoid the fall of a nominal wage, since consumptive decline reduces a living standard. This is considered to bring about the downward rigidity of wages.

4. Consumption smoothing

4.1. Model

This section clarifies the model of consumers' optimal consumer behavior over the whole life. Firstly, the model of standard economics is introduced, secondary, It shows the model which this research, and Tsukahara & Matsuzaki (2010) suggest. This model took the humane factor i.e., a physical factor and the mental factor into consideration. Here, the world which does not have uncertainty for simplification is assumed. This assume the

individual who lives 2 periods of a youth term and older term. A individual's lifetime utility U presupposes that it is shown by the following formula.

$$U = U(C_Y) + \left\{\frac{1}{1+\rho}\right\} U(C_0) \tag{1}$$

C_Y is consumption at youth term. C_0 is consumption at older term. ρ is subjective time preference rate. Although consumptive marginal utility is positive, it is assumed that the rate of change is negative. The budget constraint over this individual's whole life is shown by the following formula.

$$C_0 = (1 + r)(W + Y_Y - C_Y) + Y_0 \tag{2}$$

W is initial asset. Y_Y is income at youth term. Y_0 is income at older term. r is interest rate. An individual assumes that all of property or income are used up. Under restrictions of (2) equation, it assumes that an individual determines consumption of each term by maximizing the lifetime utility of (1) equation.

It substitute (2) equation for (1) equation, and the first order condition is calculated to maximize the lifetime utility.

$$U'(C_Y) + \left\{\frac{1+r}{1+\rho}\right\} U'(C_0) \tag{3}$$

(3) equation is a conditional equation which shows the optimal consumption of between a time and other time, and is called the Euler equation. This shows the following. If interest rate is larger than subjective time preference rate, the consumption of the older term will become larger than consumption of the youth term, and if an interest rate is smaller than subjective time preference rate, the consumption of the older term beomes smaller than the consumption of a youth term. If an interest rate and a subjective time preference rate are equal, consumption of the older term and consumption of a youth term will become equal, and consumption smoothing will be satisfied.

Secondary, It shows the model which this research, and Tsukahara & Matsuzaki (2010) suggest. This model took the humane factor i.e., a physical factor and the mental factor into consideration. A individual's lifetime utility U presupposes that it is shown by the following formula.

$$U = U_Y(C_Y) + U_0(C_0) + \delta U_Y(C_Y) \tag{4}$$

U_Y is utility at youth term. U_0 is utility at older term. δ is the residual coefficient of the utility at youth term. There are two features of this model as compared with a standard model. It explains that by using the residual effect of a utility and the difference in the enjoyment capability of utility between generations, by not using a subjective time preference rate between a time and other time. If an actual human being is assumed, utility enjoyment capability will change for every generation. In order that people's physical capability may decline with age, I think that utility enjoyment capability declines. For example, in traveling abroad, even if it is a plan of the same tour, when young, from the time which is not young, it can turn around many tourist resorts and fresh impression can be obtained. This research assumed that the utility function at youth term and older term was different, and assumes $U'_Y > U'_0$ if the same amount of consumption. If a more actual human being is assumed, I thought that there is the residual effect in utility. Consumption experience at youth term remains for years as recollections or experience. Here, this was considered to be mental positive property and it is assumed that only the rate of δ remains for years. There is Ikeda (2003) as a paper which shows about the custom formation in a consumer behavior. The budget constraint over this individual's whole life is the same as the

above-mentioned (2) equation. Under restrictions of (2) equation, it assumes that an individual determines consumption of each term by maximizing the lifetime utility of (4) equation. It substitute (2) equation for (4) equation, and the first order condition is calculated to maximize the lifetime utility.

$$U'_Y(C_Y) = \left\{\frac{1+r}{1+\delta}\right\} U'_0(C_0) \tag{5}$$

(5) equation is a conditional equation which shows the optimal consumption of between a time and other time which took the more human factor into consideration.

Although (5) equation is similar to (4) equation, even if interest rate and the residual coefficient of the utility at youth term are equal, the consumption at youth term and the consumption at older term will not become equal. It means it is not satisfied consumption smoothing through the whole life. In order to emphasize the feature of this model, the model of the standard economics when assumes that interest rate and subjective time preference rate are equal, and the model which took the more human factor when assumes that interest rate and the residual coefficient of the utility at youth term are equal into consideration is shown by a figure. A figure shows a marginal utility function. The former model is Fig.1, and the latter model is Fig.2. The model which took the humane factor into consideration can explain bigger difference of the consumption at youth term and the consumption at older term. This model enables explanation of the phenomenon in which the consumption at youth term is large compared with older term, from the difference in the utility enjoyment capability and coefficients by age.
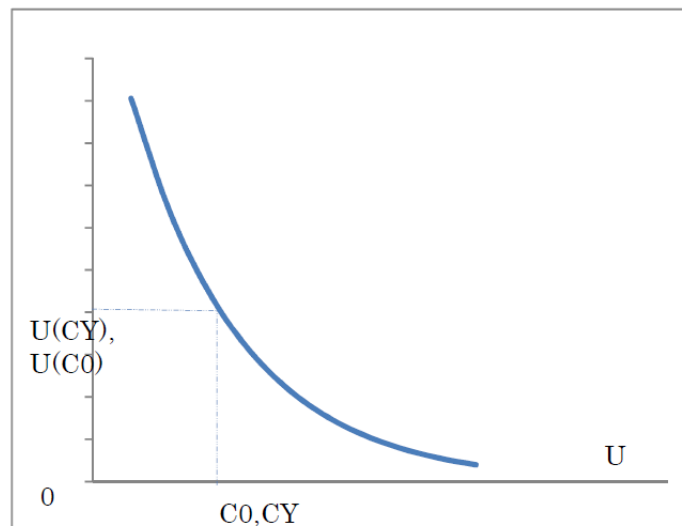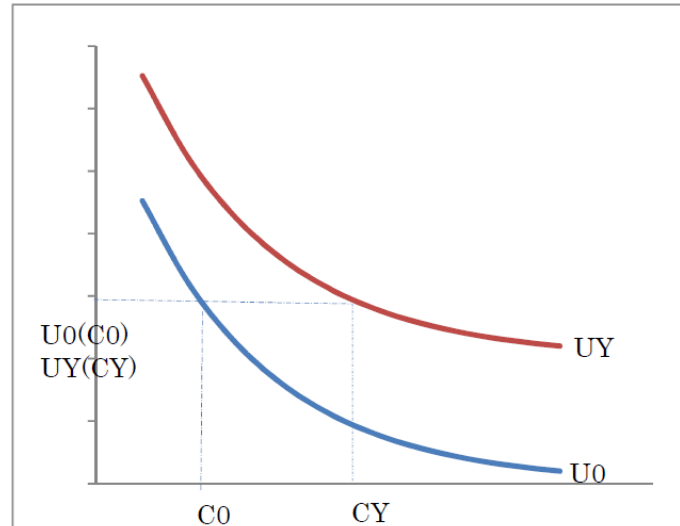

Figure 1.

Figure 2.

4.2. Estimation

Table 26 shows the descriptive statistics of the amount of consumption in every 10 years old obtained from results of an investigation. Sample size is 360. Both average value the median and a mode are decreasing as the amount of consumption in every 10 years old grows older. The question assumes the interest rate to be zero. So if subjective time preference rate is positive even if it is a model of standard economics, negative correlation of age and an amount of consumption can be explained. The Estimation of the rate of time preference using the model of standard economics is also performed. Table26 indicates relatively that the amount of consumption in every 10 years old is most largest by 30's and 20's is next large. 50's, and 60's is a degree in the middle, more 60's are small. Reduction of the amount of consumption is not constant and classification of the amount of consumption is able to made in adolescence, a its mature stage, and the golden age. This can be interpreted as it being because consumptive enjoyment capability being different in each term. That is, the adolescence when consumptive enjoyment capability is high has the large amount of consumption, the amount of consumption is decreased at the golden age which declines in consumptive enjoyment capability. The model with this conformable interpretation is a model which took the humane factor into consideration. Table 27 shows the time preference rate every adjacent 2 term using (3) equation which are a model of standard economics. In calculation, the consumption function of i term assumed $U_i = logC_i$ and it asked for marginal utility as $1/C_i$.

Table 26. *Descriptive statistics of consumption for every age (a unit is 100,000 togrigs)*

	Average	Median	Mode	Std.Dev.	Min.	Max.
20's	12.15	10	10	6.24	3	40
30's	13.01	10	10	5.67	3	40
40's	11.12	10	10	4.45	2	30
50's	10.13	10	10	4.39	2	40
60's	8.93	10	10	3.19	2	25
70's	8.43	10	10	3.09	2	20
80's	8.05	10	10	3.37	1	20

Table 27. *The point estimate of the rate of time preference for every adjacent generation*

	Estimation value
20's and 30's	0.015
30's and 40's	0.219
40's and 50's	0.121
50's and 60's	0.193
60's and 70's	0.196
70's and 80's	0.27

The above table shows that time preference rate is very unstable, although it is positive, firstly. Secondary, a time preference rate of 20's and 30's is very small, and the time preference rate of 40's and 50's is smaller than other age. Such a difference in time preference rate for every age is the same result as Tsukahara & Matsuzaki (2010) which analyzed in Japan. In the model of the standard economics which assumes the same consumption function through the whole life, and assumes a stable rate of time preference, it is difficult to explain the difference in the rate of time preference for every age. The utility function is affected by the influence of the democratization of the 1990s, or thinks that a utility function changes a lot in adolescence, a mature stage, and the golden age.

It was checked that time preference rate differ for every generation. It is proved that the utility enjoyment capability and the residual coefficient for every generation differ from each other as a different reason for every generation. It focused on the consumer behavior which led consumers' whole life. As the equation which replace with the Euler equation based on a standard economic model as a conditional expression of the optimal consumption, The equation based on the model which took the more humane factor into consideration was drawn and verified. One of the features of this model is the point that the enjoyment capability of consumption of man changes with age. The analysis result is supporting this model.

4. Conclusion

In this research, the money illusion not only has arisen, but it was checked that a time preference rate is not constant. If it is consumed as the younger age group and a rate of time preference changes with generations, it will be thought that 1-dollar value changes with generations. That is, even if the loss of the same amount produces the younger age group and an old age layer, if it is the younger age group, a loss may also feel the loss by a money illusion small. That is, the time preference rate which affects consumption smoothing also affects a money illusion. The difference for every generation of a time preference rate becomes larger than the influence which only consumption smoothing has on people's economical action. It has a possibility of bringing a big difference to the economical action for every generation. If the preference of a between at the different time changes with generations, the consumer behaviors at a certain time not only differ for every generation, but it will be thought that the reactions to a loss also differ.

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