PRINCIPLES OF BEHAVIORAL ECONOMICS

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Week 38

Lecture 38

Hello everyone, this is Lecture 38 of Principles of Behavioral Economics. We are discussing mental accounting. Now, in the applications of mental accounting, we will discuss choice bracketing and dynamic mental accounting. First of all, let us define what choice bracketing is. The evaluation and decision-making situations considered so far have essentially related to either single transactions or product bundles.

We can consider this approach as essentially a cross-sectional one, examining different components of a transaction at the same time period. However, it has already been observed that, especially in self-control situations, evaluations can be made over different time frames. Therefore, it is now necessary to take a time-series approach to evaluation and decision-making. Choice bracketing refers to how people segregate or aggregate choices over time periods. So, under this, first we will discuss prior outcomes and risky choices.

In their prospect theory paper, Kahneman and Tversky mentioned the empirical finding that betting on long shots increased on the last race of the day when the average better is losing money on the day and anxious to break even so first of all betting on long shots implies that when the probability of winning is very small then in such instances betting increases. Basically, he has already incurred many losses, is quite desperate, and out of desperation, he is at least anxious to break even. An interesting feature of this sunk-cost effect is that it depends completely on the decision to close the betting account on a daily basis. If each race were a separate account, prior races would have no effect.

Similarly, if today's betting were combined with the rest of the bettor's wealth, the prior outcome would likely be trivial. This analysis applies to other gambling decisions as well. If a series of gambles are bracketed together, then the outcome of one gamble can affect the choices made later. An investigation was conducted to understand how prior outcomes affect risky choices.

So, suppose a few problems were given; actually, three statements were given to the subjects. The first problem states that you have just won $30, now choose between a fifty percent chance to gain $9 and a fifty percent chance to lose $9, no further gain or loss. It was observed that seventy percent preferred A that is, a 50% chance to gain $9 and a 50% chance to lose $9. Statement 2.

You have just lost $30. Now choose between... a 50% chance to gain $9 and a 50% chance to lose $9—the same as in Statement 1 above—with no further gain or loss. Here in this case, 60% actually preferred no further gain or loss. The situation is different only in the sense that in the first case, you won $30, and here you have lost $30. Now, Statement 3 says that you have just lost $30. Now choose between

A 33% chance to gain $30 and a 67% chance to gain nothing. And number two is a sure $10. Here, 60% preferred the first statement or option: a 33% chance to gain $30 and a 67% chance to gain nothing. Now, problem one, reproduced here, shows that a prior gain can stimulate risk-seeking in the same account. So, once you win in the bet, that gives you some confidence, and you are willing to take more risks.

It is called the house money effect, since gamblers often refer to money they have won from the casino as house money. So basically, the amount that you have won in the casino makes you feel more comfortable with further investing, keeping your initial amount or your capital invested separate. Indeed, one often sees gamblers who have won some money early in the evening put that money into a different pocket from their own money. This way, each pocket is a separate mental account. Problems 2 and 3 show that prior losses did not stimulate risk-seeking unless the gamble offered a chance to break even.

So these are problems 2 and 3 reproduced here. Here it shows that people actually preferred no further gain or loss in case of statement 2 and preferred a 33% chance to gain $30 and a 67% chance to gain nothing. So risk-seeking was not here, but risk-seeking was here only because there was a possibility of breaking even—that if you win $30, then you are going to break even.

In the beginning, you lost $30. You can also win $30. In that case, no loss, no gain. Because there is a probability of breaking even, that's why people were risk-seeking in problem 3. The stakes used in the experiments just described were fairly large in comparison to most laboratory experiments but small compared to the wealth of the participants.

Limited experimental budgets are a fact of life. Next, we talk about narrow framing and myopic loss aversion. In the gambling decisions discussed before, the day of the experiment suggested a natural bracket. Often, gambles or investments occur over a period of time, giving the decision-maker considerable flexibility in how often to calculate gains and losses. It will come as no surprise to learn that the choice of how to bracket the gambles influences the attractiveness of the individual bets.

So basically, bracketing is important in your decision-making process. An illustration is provided by a famous problem first proposed by Paul Samuelson. Samuelson, it seems, was having lunch with an economist colleague and offered his colleague an attractive bet. The bet was that they would flip a coin, and if the colleague won, he would get $200. If he lost, he would have to pay only $100.

So, in case you win, there is a plus $200. In case you lose, there is a minus $100. The colleague turned this bet down but said that if Samuelson would be willing to play the bet 100 times, he would be game. Samuelson declined to offer this parlay. But went home and proved that this pair of choices is irrational.

So basically, his friend made an irrational decision. Because Samuelson showed that an expected utility maximizer will not accept a single play of a gamble for any wealth level that could obtain over a series of such bets, will also not accept the series. So if you do not expect to make money on the first bet and you decline it, then, following rationality, you must decline all possible bets, the series of all the bets.

There are several points of interest in this problem. First, Samuelson quotes his colleague's reasoning for rejecting the single play of the gamble. I would not bet because I would feel the $100 loss more than the $200 gain. So, see, this sounds very much like what is prescribed by prospect theory. If the loss aversion coefficient as measured by KT is 2.25, then the loss would be valued as minus 225 while the gain is only 200.

So, basically, the loss pinches more, and that is why the colleague is perfectly justified in declining the bet. Modern translation, that is, in terms of prospect theory, implies that I'm loss-averse. Second, why does he like the series of bets? Specifically, what mental accounting operation can he be using to make the series of bets attractive when the single play is not? Suppose Samuelson's colleague's preferences are a piecewise linear version of prospect theory, a value function with a loss factor of 2.25 given as 0.

Here, we are writing the utility of x as equal to x. This is, you know, a piecewise linear version. That is basically, again, a linear expression for x greater than or equal to 0 and 2.25 multiplied by x for x less than 0. Because the loss aversion coefficient is greater than 2, a single play of Samuelson's bet is obviously unattractive. We just explained that. We multiply

x by 2.25, it becomes minus 2.25, and the gain is simply 200, so it is unattractive. What about two plays? The attractiveness of two bets depends on the mental accounting rules being used. If each play of the bet is treated as a separate event, then two plays of the gamble are twice as bad as one play.

And then, as Samuelson argued, if the individual is not willing to play a single bet, he or she must not be willing to play any of them. So, a series of bets should also be rejected. However, if the bets are combined into a portfolio, then the two-bet parlay has positive expected utility with the hypothesized utility function. And as the number of repetitions increases, the portfolio becomes even more attractive. Now, in the case of two bets, there is a possibility that the fellow wins both bets—so two wins. If he wins twice, then his payoff would be 400—200 from each win—with a probability of 0.25. There is also a possibility of one

win and one loss. In that case, he would get 100 because 200 minus 100 is 100. There is a possibility of one loss—that is, first he loses and then he gains. So, one win, one loss, one gain again—this is 100. And there is a possibility of two losses, and the gain is minus 200. So, there are four alternative situations. If we assign each situation, then each situation has a probability of 0.25.

Now, since these two have the same outcome, we can combine them to have 100, 0.5 and then minus 200, 0.25. So, Samuelson's colleague should accept any number of trials of this bet strictly greater than one, as long as he does not have to watch. Now, let us work it out.

for $r = 0$, $\alpha = \beta = 0.88, \lambda = 2.25$

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

We consider the PT value function for r equals 0. Here, the reference point is assumed to be 0 because this is just coming as a random gain.

Alpha and beta were measured to be 0.88. Lambda was estimated to be 2.25. Now, this is the prospect theory value function: x raised to the power alpha for x greater than or equal to 0, and minus lambda minus x raised to the power beta for x less than 0, for r equals 0.

Now, for one bet, the prospect is simply (200, 0.5; minus 100, 0.5). The value function will be: we have minus 2.25 multiplied by 100 raised to the power 0.88, multiplied by the weighting function or decision weight, which is W minus 0.5 because this is the loss, and (200, 0.5).

In the domain of gains, 200 raised to the power 0.88 multiplied by W plus 0.5. They have equal probabilities. Now, we calculated this to be equal to 0.45, and W plus 0.5 equals 0.42. Just remember, we use the formula P raised to the power gamma plus 1 minus P raised to the power gamma, whole raised to the power 1 upon gamma.

For gains, it takes a value of 0.61. Gamma takes a value of 0.61. For loss, it is denoted by delta and takes a value of 0.69. So, plugging in these values, I obtained these numbers, and multiplying, I have—or from this expression—minus 14.23.

$$V(f)$$
$$= -2.25 \times 100^{0.88}[w^-(0.5)] + 200^{0.88}[w^+(0.5)]$$
$$= -2.25 \times 57.54 \times 0.45 + 108.90 \times 0.42 = -14.23$$

So, the overall value is negative; it is obvious that the individual will not accept the bet.

For two bets, the prospect is already explained. The value function now would be: we begin from the lowest value, which is minus 200. So, this is the value scale calculation multiplied by W minus 0.25. Then we have 100 raised to the power of 0.88. We are using cumulative prospect theory or cumulative decision weights.

So that is why W plus 0.5 plus 0.25 minus W plus 0.25—that is subtracting this. And then finally, 400 raised to the power of 0.88 multiplied by W plus 0.25. This gives us a value of 2.67. This is positive. So, any bet greater than 1 should be accepted.

$$V(f) = -2.25 \times 200^{0.88}[w^{-}(0.25)] + 100^{0.88}[w^{+}(0.5 + 0.25) - w^{+}(0.25)] +$$

$$\text{where } w^{-}(0.25) = 0.293,\ w^{+}(0.25) = 0.291,\ w^{+}(0.75) = 0.57$$

And as we increase the number of bets, you can calculate yourself that the value actually increases. These are the values of W minus W plus calculated.

More generally, loss-averse people are more willing to take risks if they combine many bets together than if they consider them one at a time. Indeed, although the puzzle to Samuelson was why his colleague was willing to accept the series of bets, the real puzzle is why he was unwilling to play one. Risk aversion cannot be a satisfactory explanation if his colleague has any significant wealth.

To explain the fact that many people reject attractive small bets such as Samuelson's colleagues, we need a combination of loss aversion and one-bet-at-a-time mental accounting. There is a mental accounting explanation for what economists call the equity premium puzzle. The equity premium is basically the difference in the rate of return on equities or stocks and a safe investment such as treasury bills. Since stocks are riskier, you essentially ask for a premium—a higher return. This is known as the equity premium.

The puzzle is that the difference in the rate of return on these two assets has historically been very large. Thaler noted that in the USA, a dollar invested in stocks on January 1, 1926, was worth more than $1,800 on January 1, 1998. Whereas, a dollar invested in treasury bills was worth only about $15. So, this has increased from 1 to 1,800—an 1,800-fold increase—while the other has increased only 15-fold. And half of that was eaten up by inflation.

So, if you consider the inflationary factor, then this $15 would actually appear even smaller. Though part of this difference can be explained by risk, the level of risk aversion necessary to explain such a large difference in returns is implausible. So, if you go by loss aversion factors, you would find that no loss aversion coefficient or risk aversion coefficient would be large enough to explain the difference between these two. One way to examine this is to consider how frequently investors should evaluate their investments to make themselves indifferent between the two.

If investors have prospect theory preferences, simulations suggest a period of 13 months. If you evaluate it after a period of 13 months, you would be indifferent between the two investments, either stocks or bonds. This outcome implies that if the most prominent evaluation period for investors is once a year, the equity premium puzzle is solved. That is, if investors evaluate more frequently—less than 13 months—then they would, of course, find bonds safer and more attractive,

and they would invest in bonds rather than stocks. Alternatively, if investors have a narrow frame of evaluation—once a year or more frequently, less than a year—the equity premium puzzle could be explained. This is termed myopic loss aversion. The disparaging term 'myopic' seems appropriate because frequent evaluations prevent investors from adopting a strategy that would be preferred over an appropriately long time horizon. So, when we are unable to see things at a distance, we suffer from myopia.

The term 'myopic' is applied here because when we fail to see the long-term potential of stock investments, we may end up choosing bonds, which may appear attractive in the short term but, in the long term, stocks yield much greater value. Indeed, experimental evidence supports the view that when a long-term horizon is imposed externally, subjects take more risk. For example, in an experiment, subjects made investment decisions between stocks and bonds at frequencies simulating either eight times a year, once a year, or once every five years. Subjects in the two long-term conditions invested roughly two-thirds of their funds in stocks, while those in the frequent evaluation condition invested 59% of their assets in bonds.

So when you are frequently evaluating, you invest in safer assets, which produce lower returns. But if your evaluation periods are longer, you might end up investing in stocks, which give you higher returns. Similarly, in another experiment, the staff members at a university were asked how they would invest their retirement money. They had to choose between two investment funds, A and B: one based on stock returns, the other on bonds. So, A and B are two alternatives: one is based on stocks, the other on bonds.

Stocks are riskier; bonds are safer. One group examined a chart showing the distribution of one-year rates of return. The other group was shown the simulated distribution of 30-year rates of return. So one is showing short-term rates. One group sees short-term rates; another sees long-term rates.

Those who saw the one-year returns—that is, short-term rates—said they would invest a majority of their funds in bonds, the safer assets. Whereas those shown the 30-year returns invested 90% of their funds in stocks. So, when you look at the long-term returns generated, you understand that stocks are preferred over bonds. Myopic loss aversion is an example of a more general phenomenon that Kahneman and Lovallo called narrow framing. Projects are evaluated one at a time rather than as part of an overall portfolio.

This tendency can lead to an extreme unwillingness to take risks. Narrow bracketing can also have other perverse side effects. For example, in New York, As in many cities, cab drivers typically rent their cars for a 12-hour period for a fixed fee. They are then entitled to keep all the revenue they earn during that half-day.

Since 12 hours is a long time to drive a car, especially in New York City, drivers must decide each day how long to drive—that is, whether to keep the car for the full 12 hours or quit earlier. This decision is complicated by the fact that there is more demand for their services on some days than others, specifically on days with certain disruptions. It could be weather-related disruptions; if it's raining, people would need taxi services more compared to a normal day. A rational analysis would lead drivers to work longer hours on busy days, as this policy would maximize earnings per hour worked. So on days with greater demand,

you can have more rides and earn more money. At the same time, your hourly rate could also be higher. Overall, there would be an increase in income. Rational analysis suggests that a rational individual would always seek higher income. Working the same 12 hours, if you can earn more money, why not?

So you must work more on the days when there are certain disruptions or on the days which are busy. If instead drivers establish a target earnings level per day, they will tend to quit earlier on good days. So basically, if the drivers think, 'Every day I must make $3,000—$3,000 done,' they would quit. The elasticity of hours worked with respect to the daily wage, as measured by the earnings of other drivers that day, is strongly negative. So as the hours worked increase, the daily wage—basically, there is a negative relationship—the daily wage decreases.

So if the daily wage increases, alternatively, I would say the hours worked decrease. The implication is that taxi drivers do their mental accounting one day at a time. They are not thinking about their long-term goals—how much money to build up, save, etc. Another thing is the diversification heuristic. The unit of analysis can also influence how much variety consumers elect.

In an experiment, children were asked to select among six snacks, like candy bars, chips, etc. In one of the two conditions—sequential choice—they picked one of the six snacks at each of three class meetings held a week apart. In simultaneous choice, on the first class meeting, they selected three snacks to be consumed—one snack per week—over the three class meetings. So in one situation, they are asked to choose sequentially—when you are going for a meeting, you are choosing one snack—and in the other case, simultaneous choice, in the first class meeting, you have to tell what snacks you need in the upcoming meetings as well as today's meeting.

It was observed that in the simultaneous choice condition, subjects displayed much more variety-seeking than in the sequential choice condition. For example, in the simultaneous choice condition, 64% of the subjects chose three different snacks, whereas in the sequential condition, only 9% of the subjects made this choice. So in the case of sequential condition, suppose a child comes for a meeting, she or he has one particular snack as the most favorite one. So it's highly possible that every time she comes for the meeting, she would pick up the same snack. This is happening, you know, a week apart.

While if a child is asked to pick up three things, then chances are very high that she would pick up three different things. So this is called the diversification heuristic. This behavior might be explained by variety-seeking serving as a choice heuristic. Alternatively, people tend to diversify when asked to make several choices simultaneously. A failure to account for this kind of behavior may lead to incorrect predictions.

Read and Loewenstein called this diversification bias and observed similar patterns in their experiments when candies picked up by kids on Halloween night. So in that experiment, the subjects were young trick-or-treaters who approached two adjacent houses, for example. In one condition, the children were offered a choice between two candies at each house. So you have to choose one between, you know, two candies offered. In the other condition, they were told at the first house they reached to choose whichever two candy bars they liked.

Large piles of both candies were displayed to ensure that the children would not think it rude to take two of the same. So basically, they can pick any two. The results showed a strong diversification bias in the simultaneous choice condition. Every child selected one of each candy. In contrast, only 48% of the children in the sequential choice condition picked different candies.

So in the first condition, when they were asked to pick one candy out of two, then in each and every house, the children were likely picking the same candy. While when they were asked to pick any two candies, most of them selected different candies. This result is striking since, in either case, the candies are dumped into a bag and consumed later, so it is the portfolio in the bag that matters. Not the portfolio selected at each house. Benartzi and Thaler have found evidence of the same phenomenon by studying how people allocate their retirement funds across various investment vehicles.

There, also, a diversification bias is observed. In particular, they found some evidence for an extreme version of this bias, called the 1 by n heuristic, where if an employee is offered N funds to choose from, then she evenly divides the money among the funds offered. So, suppose I have four alternatives to invest my money, and I have 10,000 to invest. It has been observed that I would equally divide 10,000 into the four funds, that is, investing 2,500 in each one of them.

So, this is called 1 by n heuristics. This heuristic can be utilized to increase exposure to any particular type of fund. Now, this can actually be useful as well. How? The use of this heuristic or others only slightly more sophisticated implies that the asset allocation an investor chooses will depend strongly on the array of funds offered in the retirement plan.

Thus, in a plan that offered one stock fund and one bond fund, the average allocation would be 50% stocks and 50% bonds. But if another stock fund were added, then again they would divide it equally, like 33% in one fund, 33% in the second, and 33% in the third. One of these is a bond, and the other two are stocks. So, if there is a tendency to equally divide the money into all funds, then you can understand that the allocation to stocks would jump to two-thirds.

They also observed that employees seem to put stock in the company they work for into a separate mental account. So, stocks of other companies and stock of the company they work for are again different accounts. For companies that do not offer their own stock as one of the options in the pension plan, the employees invest 49% of their money in bonds and 51% in stocks. So, roughly a 50-50 division is there.

When the company stock is included in the plan, this investment attracts 42% of the funds. So when the company stocks are offered, people invest 42% of their money in the company stock. If the employees wanted to attain 50% equity exposure, then generally the tendency is to go for a 51% investment in stock or 50% exposure to stock. So in that case, they have already invested 42%. So they should have actually invested 8% of their money in stocks, the leftover, and the rest should be in bonds, like again 49% to 50% in bonds.

Instead, it is observed that they invest their non-company stock funds again evenly. So 29% in stocks and 29% in bonds. So once they have invested 42% in their company's stock, then they are left with 58%. Now consider the other funds that are available. One is a stock and the other one is a bond fund.

So then you are dividing 58% equally between the two and allocating 29% and 29% to each. This also results in higher exposure to the stocks. These are in the market. These are the company stocks. So with this, I conclude the discussion on choice bracketing, where we primarily discussed narrow framing or myopic loss aversion.

We have also discussed the diversification bias. We will continue our discussions on mental accounting, primarily focusing on the policy implications of mental accounting in the next module. Thank you.