Health Economics

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Week – 06

Lecture 30- Time Inconsistency and Health: Discounting

Welcome, friends, to our NPTEL MOOC module on Health Economics. We are discussing time inconsistency and health today, particularly discounting. So, we did in the last class on prospect theory developed by Kahneman and Tversky compared to the traditional expected utility theory. This lecture will discuss the beta-delta discounting model, which is discounted due to time consistency or inconsistencies. Again, as far as time inconsistencies are concerned, it depends on the approach the person follows, whether it is a sophisticated or naive approach. We will discuss that and the sophisticated one, and again, we will emphasise one, what kind of commitment mechanisms are explained.

More importantly, in this lecture, we clarify the possible biases due to the role of time. So, time discounting is the simple meaning of it, giving the individual the highest value of what the person is carrying at that time. Usually, a person has a little less importance to the other time period or the different time period and is considered to be discounted. If the same values persist in people's minds during different periods, we usually consider them time consistency. So, the beta and delta method or the coefficient or the approach are helpful for understanding the discounting aspects.

We will also discuss some possibilities of the hot brain versus cold brain model and emphasise the context of behavioural welfare economics. Time inconsistencies are a sub-theory within behavioural economics, giving a present bias. The person has the highest bias towards the present rather than the future. Time-inconsistent decision-makers are commonly described as having different selves at certain points in time and making inconsistent choices with each other. Like prospect theory, the notion of time inconsistency is a significant challenge for classical welfare economics, which assumes that people have consistent, complete and transitive preferences.

Some examples of time inconsistencies are procrastination, unhealthy lifestyle choices, impulse buying, smoking and substance abuse, credit card lead debt and saving and retirement planning etc., which used to have some importance to the role of time and that too the t_1 or the present period t_0. So, credit card users used to have the habit of spending higher amounts irrespective of what kind of burden it would create later. Similarly, smoking and substance abuse are also relevant to explain. Once you get used to it, you will find it more valuable than thinking about future values. Similarly, impulse buying, unhealthy lifestyle choices, etc. So, time inconsistency has a strong relationship with health. Time inconsistency can explain many puzzles in health. Why do people buy gym memberships but fail to visit the gym? Why do people postpone plans to quit smoking even when they know that it is creating adverse health? Why do people have so much trouble seeking a healthy diet? These are common examples where time inconsistency really plays an important role.

Time inconsistency explains many other phenomena that the standard neoclassical economics cannot explain. The theory of time inconsistency also implies tools that both government and markets can use to improve the ability of time-inconsistent individuals to keep their cold brain's plan. We are now heading to explain the method for understanding time discounting through the beta delta discounting model. So, did you buy a ticket to one example you are just citing so you can start understanding this time discounting? Did you buy a ticket for the cricket World Cup several months ago, or did you secure a ticket for the Sonu Nigam concert well in advance? Usually, this happens when people give value by purchasing the ticket in advance.

The fact that people make these purchases beforehand suggests that they derive utility in advance, explaining their decision to buy the tickets beforehand. Individuals derive utility from both present joys and the anticipation of future happiness. In order to accommodate this reality, economists represent total utility by combining the weighted sum of immediate utility levels in the current period with those from other subsequent periods. Hence, the total utility we will discuss is not just the present period; the overall function of all utilities in different periods. So, different time periods and utilities are important.

So, we are supposed to add today, tomorrow, the day after tomorrow, and so on. In equations a, b, and c, these coefficients are indeed the weights given to utility from different time periods. People do not value utility equally in all periods. So, a, b, c, etc., will not necessarily be equal.

$U_{overall} = aU_{today}+bU_{tomorrow}+cU_{the\ next\ day}+\ldots\ldots$

If it follows a constancy, it is obviously not the time-inconsistent model. Hence, the vector of weights we just discussed, their a, b, c, etc., is called a discounting function because we see that a>b>c. So, the discounting function is a vector of weight that indicates how much an individual value is useful in the present and future periods.

The beta-delta discounting formulation was developed by Phelps and Pollock in 1968. So, as we just observed from the equation, the overall utility, we find that a is indeed greater than that of b and c. So, the beta-delta discounting functions are assumed to decrease monotonically and reasonably approximated with two parameters. So, the two parameters are largely approximated. So, U overall or the utility overall is in the present period, which is delta to the power 0 plus in the second period beta times delta 1. In the third one, there is a beta-delta square on the very next end, and so on.

$$U_{overall} = \delta^0\, U_{today} + \beta\delta^1\, U_{tomorrow} + \beta\delta^2 U_{the\ next\ day} + \cdots$$

So, that means overall, we find that the beta we just got will be equal to the utility we get today and where the delta value is considered to be following the complete one at that moment. So, today's utility is delta to power 0, and/or in the present period, it is considered to be 1. The rest have a beta function for tomorrow and the next day, and there are other deltas for power 1, deltas for power 2, and so on.

$$U_{overall} = U_{today} + \beta[\delta U_{tomorrow} + \delta^2 U_{the\ next\ day} + \cdots]$$

One thing that is very important to mention is that the β has a strict upper limit and lower limit. It has 0 and 1, whereas the δ's upper limit is 1, whereas the lower limit is not strictly 0; hence the bracket is different.

$$\beta \epsilon\ 0{,}1\ ;\ \delta \epsilon (0{,}1]$$

So, β is the present bias parameter, which we have just shown you, the present bias parameter that discounts utility in all non-current periods. So, since we have a strong bias, the bias gets discounted in other non-current periods, whereas δ is the discount factor parameter. Discounts utility incrementally more in each subsequent period. If the β declines below 1, it has a present bias and time inconsistency. If it is strong strictly 1, it is a time-consistent preference function.

Within the beta-delta discounting model, we follow a time-consistent preference if the β is strictly 1 or no present bias is identified. Whereas the utility from period t is the worth δ^t as much as the utility in the current period. So, the exponential discounting function, which is just mentioned as a δ^t, explains the extent of inconsistencies and the discounting. So, overall, the utility is equal to U_0 plus U_0 because we have just said there is no discounting. There are 100 percent biases noted in the very first period. In other periods, you just see that there are discounts, which are explained by the sigmas, not the δ.

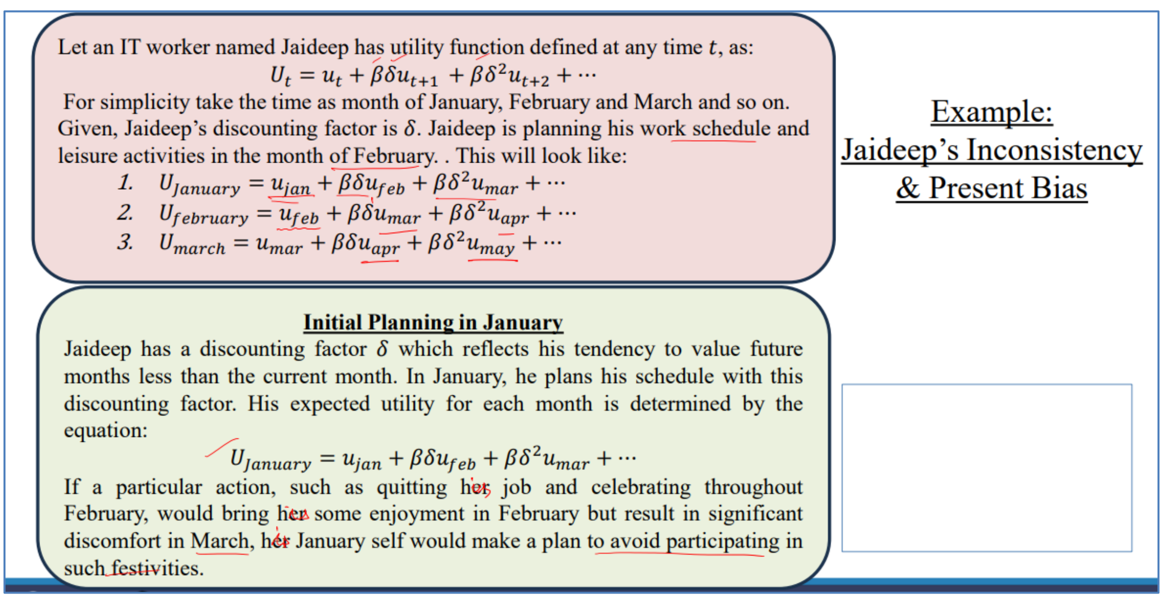
A discounting function with a higher delta weights future utility more highly. So, higher deltas correspond to more patience and more forward-looking behaviour. So, time-consistent preference clarifies that the preference is shared across all sales so that future sales will not alter a plan and that a previous self-found is optimal. So, one example is mentioned originally by Becker and Murphy. So that addiction is not irrational and addicts have time-consistent preferences.

Hence, they are in a position not to forgive their behaviour because they have a consistent preference function. Hence, they are not irrational. In 1988, Gary Becker and Kevin Murphy developed a theory of rational addiction. According to them, addicts are fully aware of their addictive nature, and this addiction does not create time inconsistency. Just take note that this does not create time inconsistency.

A fully rational, time-consistent nicotine addict picks the label of smoking in each period to maximise overall utility. Addicts are indeed fully aware of the increase in cigarette consumption in the future and the health issues caused. Thus, he balances his cost against the upfront utility he enjoys from a cigarette now. Coming to another aspect is called myopia and hot brains as part of time-inconsistent preferences. Here are the preferences, such as future sales, which will sometimes alter a plan that a previous self found optimal.

These preferences are also called myopic. So, usually, myopic is considered to be short-sighted. Because the future self will indeed alter that plan against the previous one. Within the beta-delta model, the utility function is time inconsistent if the β is less than 1. The resulting utility function is said to exhibit hyperbolic discounting because, on the other hand, it is not going to be consistent or constant.

So, this hyperbolic discounting might be of two types: steep discounting, a huge fall diminishing utility rate in the future, or just a flatter discounting utility. We are just citing an example here of how we will also calculate with the help of another real example. We are just giving you the background on how you can proceed. Let an IT worker named Jaideep have a utility function defined at any time t. Hence, we have just mentioned that t, t plus 1 and its delta function, then beta levels, respectively.



For simplicity, take the time in January, February, March, and so on. Given Jaideep's discounting factor, delta, Jaideep is planning his work schedule and leisure activities for February. This will, of course, and if so, we can write down the utility function accordingly. Hence, the utility function of January would be the present one with no discounting component. Then there will be beta of delta of utility February and delta square of utility March. And if the person that is Jaideep starts with the plan from February, then of course, January is not that important in that case.

We start with the discounting factor from March onwards. You can see delta to power 1, then 2 from March onwards. If the plan is from March only, then, of course, the function will be accordingly varies. So, we are just presenting Jaideep's inconsistency and present bias. Where is the present bias based on the plan? So, initial planning if in January, Jaideep has a discounting factor of delta, reflecting his tendency to value future months less than the current month.

Shift in February

When February arrives, Jaideep experiences a shift in his discounting behavior. Instead of discounting the u_{feb}, he now discounts the u_{mar} and beyond. This shift is influenced by a factor β, where $\beta \epsilon [0,1]$. If $\beta < 1$, is implies a significant change in perspective compared to his initial expectations in January. The equation becomes in February:

$$U_{february} = u_{feb} + \beta\delta u_{mar} + \beta\delta^2 u_{apr} + \cdots$$

→ The shift in discounting means that Jaideep might now perceive the u_{feb} as comparison to u_{mar} as more valuable than he initially thought in January.

→ He quits his job and celebrates all month in February.

Example: Jaideep's Inconsistency & Present Bias

We can study the time-inconsistent preferences by comparing how Jaideep feels about U_{feb} *and* U_{mar} in January and how he feels about the same in February.

- In January, he anticipates the discounting of δ between February and March.
- As soon as he reaches in February, he realizes that the discounting between February and March is actually $\beta * \delta$ and his preferences becomes inconsistent with axioms of rationality.

In January, he plans his schedule with his discounting factor. His expected utility, which I have just mentioned, is like this. If a particular action such as quitting her job or Jaideep's job and celebrating throughout February would bring his employment in February but result in significant discomfort in March. In January, he made a plan to avoid participating in such festivities. It depends upon where the plan starts.

It starts from February, then from March onwards the discounting matters. If it is in instead of January, if it starts in February, the utility function as per the time discounting would start from February. Then the discounting factor starts in March. The shift in discounting means that Jaideep might now perceive the utility of February compared to the utility of March as more valuable than he initially thought in January because he is planning in February now. He quits his job and celebrates all month in February. So, we can study the time-inconsistent preferences by comparing how Jaideep feels about the utility in February or utility in March, in January, the different utility bundles of different months in January and how he feels about the same in February because of his shift in his plan.

So, as I already mentioned in January, he anticipates that the discounting of that is delta between February and March if there are three months of planning. As soon as he reaches February, he realises that the discounting between February and March is beta times delta, and his preferences become inconsistent with axioms of rationality. We are presenting another example with a similar approach by giving you a case with a numeric example. We start with Shruti's case. Shruti has 1001 pieces of candy, which he has to eat in three months, maybe in January, February and March only, not extending beyond that period.

Her utility function from this candy consumption is a logarithmic function, which is

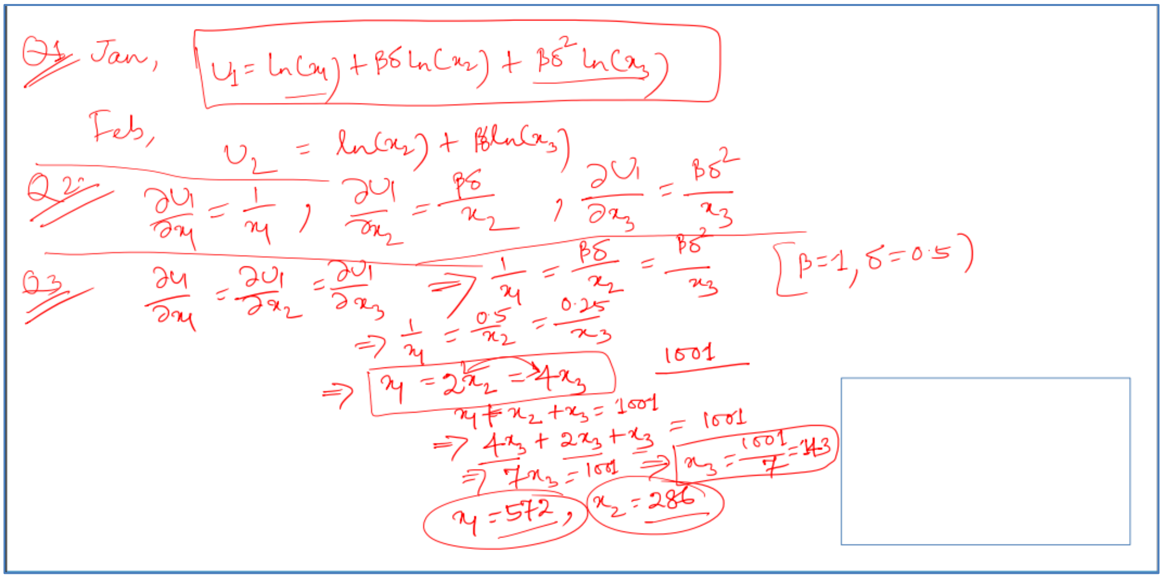
U(x) = ln(x).

This is what we have just given as per the question. Where x is the number of pieces consumed in one month, let the utility function given in the question be U_1, x_1 in January and U_2, x_2 in February and March, respectively and U_2, x_2 in February and U_3, x_3 in March, respectively. So Shruti also has a beta-delta discounter.

So this is the hint given to us. What I will do you may try in your home this question; we are giving you a hint in-between. So basically, this is, in short, Shruti's candy dilemma. What kind of utility is based on the time discounting Sruti is deriving in different periods? What should Shruti do? So, write down her overall utility function each month. We can write it down since the utility function has already been given to us.

So, suppose we are supposed to write the overall utility function for each month, but the utility function has already been given to us. So, it is a logarithmic function. So, we are supposed to write it down using the beta delta discounting formula. So, we are supposed to have a utility function like this. In January, we have to note that in January what is there and in January particularly the utility function for January, in particular, will be ln X1 plus; then we are supposed to include the beta delta function, beta delta times ln X2, and then of course beta delta square ln X3 since three period time is given to Sruti.

However, if the plan is for February, we have already mentioned writing down the overall utility function for each month. So, in February, what happens is that utility 2 lets it be, and then January is missing from the equation. It will be, of course, and there will be no discounting in the period of February if the plan is for February itself. So it will be ln X2 and plus beta ln X3. Then discounting should be also given beta delta, then X3. So, it is not beta delta square; it is only the first period, and then March becomes the first period.



So, this is what we have just written. Coming to the second question, for March, of course, we are not writing it down as it is just ln X_3. So, from the perspective of Sruti's January sale, what is her marginal utility in adding a piece of candy in January? So, what is her marginal utility of adding a piece of candy in January? If a piece of candy is added to Sruti's consumption basket per the January sale plan, what sort of utility marginal utility does Shruti derive? Also, find marginal utility from candy consumption in February and March for January sale for Shruti. So what we do for question number 2, we will discuss the marginal utility of adding. So, in simple terms, we have said $\frac{du_1}{dx_1}$. Moreover, similarly, for $\frac{du_1}{dx_2}$, then$\frac{du_1}{dx_3}$Because we have already mentioned the question here, what is the marginal utility derived from the candy consumption in different periods if we follow the January plan or January sale of Shruti? So try to understand that our plan is from January itself.

Hence the marginal utility of adding the utility to the next month starts from the changes in the January itself. Hence, the total utility to overall utility is the one you have just derived. From there we will take $\frac{du_1}{dx_1}$, then of course from this equation it will be 1 of x1 time 1 of x1 because it is then dx1 by dx1, so it cancels out and it is only 1 upon x1. So far as $\frac{du_1}{dx_2}$, is concerned, then from the second component, others are going to be 0, and here our common component will be beta delta. So, that is actually beta delta, and then, of course, it will be 1 upon x2 or divided by x2.

Then, the third component will be $\frac{du_1}{dx_3}$ which is equal to the beta delta square divided by x3. So, we have just mentioned this here. So now we are going to discuss about the third question. First, we have done it, second, we have also done it, and then we will address the third. Suppose Sruti is time consistent; that means the beta is going to be 1 and has a discount rate of 0.5, and the discount rate is now no more same. So, it is 0.5, we have already mentioned that if every time discount rate is half, then allocate all the candies in 3 months, maximising overall utility. So, that means the target is to maximise each month's overall utility every month. Hence, the change in utility in each month due to the allocation of the candy should be equal to each other, which means $\frac{du_1}{dx_1}$, is equal to $\frac{du_1}{dx_2}$, is equal to $\frac{du_1}{dx_3}$, etc. So, in this case, a hint is also given that each piece of candy will give her equal satisfaction. Moreover, to maximise her overall utility, she chooses a candy allocation that equates to her three derivatives from the previous exercise.

So, that means we are supposed to equate. So, our question tries to understand we have given a value that if beta is consistent and we have a time discounting rate of 0.5, then you allocate the candy so that the utility gets maximised. So, what is the allocation of the candy? That is our question. So, the first aspect in question 3 is that we have to discuss one equality condition now that your first derivative based on the January plan is maximising; that is, the hint has already been given. So, that means you have $\frac{du_1}{dx_1}$, equal to $\frac{du_1}{dx_2}$, which should equal $\frac{du_1}{dx_3}$.

So, this implies you should have $\frac{1}{x_1}$, which should be equal to $\frac{\beta\delta}{x_2}$, and which should be equal to $\frac{\beta\delta^2}{x_3}$, which should be the following: If we just simply put the value which is given to us, what the value it is given you just check on your own what the values are given, beta is following a time consistent pattern and we have a discounting rate that is the delta equal to 0.5. So, in each case, we can put our values first. So, this implies that 1 upon x1 should equal to your beta is 1, beta is 1, and delta is 0.5

So, 0.5 divided by X_2 should equal to, so square of 0.5 should equal to 0.25 divided by X_3. This is what very clearly mentioned. So, if we solve this, you will find one thing very clearly: here is one-fourth. So, what is important here, we have already mentioned that the x1, so from this what we derive is that X_1 equal to 2 X_2 is equal to 4 of X_3.

$$x_1 = 2x_2 = 4x_3$$

So, this is what is derived. If you put these together, we all know that the total candy total number of candies and Shruti is 1001. So, for all these periods, it has to be consumed. So, that means x1, x2 and x3 should be utilising or consuming the entire 1001 candies. However, we have already got an identity that is equal to this. So, if you put it, to find out the value, we can just put in the place of x1, x1 equal to 4 x3, then x2, x3, etcetera, x1 equal to 2, and if you just put this, you will find a value like 4 x3 plus 2 x3 plus x3.

Q4 $x_2+x_3 = 1001 - 572 = 429$

$$U_2 = \ln(x_2)+\beta\delta\ln(x_3)$$

$$\frac{\partial U_2}{\partial x_2} = \frac{1}{x_2}\;;\; \frac{\partial U_2}{\partial x_3} = \frac{\beta\delta}{x_3} \Rightarrow \frac{1}{x_2} = \frac{\beta\delta}{x_3} \Rightarrow \frac{1}{x_2} = \frac{0.5}{x_3} \Rightarrow x_2 = 2x_3$$

$$x_2+x_3 = 429 \Rightarrow 2x_3+x_3 = 429 \Rightarrow x_3 = \frac{429}{3} = 143$$

$$x_2 = 286$$

Q5 Jan $$\boxed{\frac{1}{x_1} = \frac{\beta\delta}{x_2} = \frac{\beta\delta^2}{x_3}} \Rightarrow \frac{1}{x_1} = \frac{0.25}{x_2} = \frac{0.125}{x_3} = \Rightarrow x_1 = 728,\; x_2 = 182,\; x_3 = 91$$

Feb, $$\frac{1}{x_2} = \frac{0.25}{x_3} \Rightarrow x_2 = 218,\; x_3 = 546$$

This is what we just said because x2 equals 2 x3; from this, we can easily see that x2 equals 2 x3. So, we have just put it here, and then x1 equals 4 x3, and then x3 is there. So, this would equal to 1001. To solve it, this is actually 7 x3 equals 1001; hence, the x3 value we have already derived is 1001 divided by 7.

So, this is roughly equal to 143. So, based on this identity we just derived, we can derive other figures. So, x3, we have derived, and then we can also derive the value of x1. So, x1 is equal to 4 times x3, so 143 into 4, so it is equal to 572. And then x2 equals 2, so x2 is actually 2 x3, then double of this that is 286.

In this case, comparing x1, then x2 and x3 is very important. As per the question, you can just read what kind of allocation Shruti will make, given the discounting rate of 0.5. It is quite obvious that given the 0.5 of discounting rate, Shruti is allocating 572 in the first period, then the second period less of it 286, and then in the third period it is 143.

I hope it is quite clear and you can also try on your own. And the next question you will see is whether Shruti will reallocate her distribution in February. If it is, we start with Shruti's January plan, but if the reallocation is met, each Shruti will reallocate her distribution if the plan is through February. So that is then the utility function has to be reframed again. The utility is based on the logarithmic function, which has just done it; we can also do it here.

Hence, the utility function will start from x2 and continue to x2 and x3. So for question number 4, we just have a look what we did that for Shruti's February self; we know that in the first period it is of 572 candies have already been distributed in January itself. So, how much out of the 1001 candies are left that is 1000 minus 572. So, for the other two periods for x2 and x3, the total candies must be 1001 minus 572. So that should be 429. So, these candies are left for the other two periods, February and March, for x2 and x3.

We have a utility function given. So, we have to reframe the utility function. We know that utility is equal to logarithmic function ln of x. So, the utility at period 2 will be, of course, there should not be any discounting in period 2 because we start from the February plan.

However, there will be a discount based on the figure delta of x3. Again we are supposed to take the marginal changes or the marginal utilities by taking the first derivative of this U2 which you already did it.

It has to be with respect to x2 first. So, it has to be then 1 upon x2. Then, the second one that, is $\frac{du_2}{dx_3}$, has to be $\frac{\beta\delta}{x_3}$. That is now, we have got it. As per our first suggestion, the consumer is attempting to optimize the utility. The marginal changes have to be equal in the utility bundle, which implies that as per question 1 upon x2 should be equal to the beta delta of x3.

That means 1 upon x2 is equal to delta is 0.5 we have already taken. That is when beta is 1, so it is 0.5 divided by x3. So, you can easily find out.

So, $x_2 = 2x_3$. This is what we have derived. So we did it. Similarly, based on the value, we know that this total x2 and 2 or x; this is the total we have how many? $3X_3$, isn't it? So how many are left? It is actually 400. So, in total,

$$x_2 + x_3 = 429$$

This is what we did. We already mentioned it. So X_2 is equal to $2X_3$. We just derived this. So $2x_3 + x_3 = 429$. This implies that X_3 is equal to 429 divided by 3. So this is precisely 143, and based on this we can also find out that X_2 is equal to 286. So, for this one, we just go back and check what we derived in the previous case where the plan was from January for Shruti to start her plan from January, and their discounting based on the discounting rate of 0.5, the allocation was indeed of for the X_2 it was up to 286 and for X_3 it was 143. Precisely the same is derived again if the plan is from February. So this means that since the discounting rate is constant, that is 0.5, we are getting the same rate even if it is planned from February. So that means the same reallocation as in January Shruti did. The last question, question number 5, is if Shruti is a hyperbolic discounter, so this means it is attached with the beta values and the discounting factor or the value.

So delta, 0.5 times another 0.5, and beta times delta both matter. How will we see and allocate candies again in January and February? We have already derived the utility function for January and February. We are supposed to simply for question number 5, we have already got the function that is for the January plan again, we have to do the same approach we did it January and February. We derived it,

$$x_1 = \frac{\beta\delta}{x_2} = \frac{\beta\delta^2}{x_3}$$

This is the identity we derived from the function. We are just simply going to put the values of beta and delta. If you put the beta and delta here, 1 by X_1, of course, 0.5 into 0.5 equal to 0.25 divided by X_2, so equal to then 0.5 square, so it is precisely 125 divided by X_3, then by solving this, we will find the value of X_1 equal to 728, then X_2 is equal to 182 and then X_3

equal to 91. You just see the changes as compared to when there is no hyperbolic discounting. And in this case, one interesting find you will get it for February from the equation from the February one, the marginal utilities are this one equal to 0.25 divided by X_3 from this you will find X_2 equal to 218 and X_3 is equal to 54.6. Now just compare X_2 of the February plan and X_2 of the January plan. And X_3 of the February plan is against X_3 of the January plan. So, you will find there are changes because of hyperbolic discounting. So, it is not the same.

Earlier, we saw that it was the same, but now you will find differences, which have been reduced again. Here, Shruti will feel that it is better to consume or get more utility from the first period itself, that is, in January, because more consumption attempts are taken in January itself because discounting rates are very high later. So, that is so far as the candy dilemma is concerned. We have clarified based on the example. There are a couple of other contexts I am just wrapping through.

I am not explaining much since we have already consumed time. I will just tell you what are in our basket for this explanation. I may give you time. Let me explain this in another 5 minutes and with that our approach will be completed, and our target will be completed for this lecture. So far as hot brains and cold brains models are concerned, I think I will suggest you to read. You might have seen Thanda "Dimag Garam" where hot brains were short-sighted and actions are usually noted, dissents were noted and these are time-inconsistent solid preferences.

Whereas cold ones they plan for everyone, and they have a strong position for consistency in their approach or preferences. So, I am not discussing much here. I am just linking with one discourse called neuroeconomics, which was mainly discussed. Another one is called commitment mechanisms. Once the commitment is made, people usually stick to their approach, making them more consistent.

So, like restricted savings accounts that prohibit withdrawals until the holiday shopping season, like alarm clocks that shred 100 bills each time the snooze bottom is pressed. Some examples are given, like alarm clocks; let me clarify: if you are not consistent enough in your regular schedule and have taken the help of an alarm clock, an alarm clock is chargeable. If you are putting your hand on your snooze button, then you are supposed to pay a certain amount; hence the alarm clock indicates that you are not consistent in your behavior. Once you are consistent, you might have woken up earlier, no need to put the snow's button.

Another example we have given I can go through for further clarity. Coming to another, clarifications and some conceptualisation are required, called sophisticates versus naive. So, sophisticates are the one who ever of their own time inconsistency are called sophisticates, but whereas naive are the people who are on their own time inconsistency and a naive will not demand any self-commitment device, whereas the sophisticate will demand a self-commitment device because he or she knows it. So you can please read in between, I am not mentioning much. Coming to the same smoking addiction model we have already started discussing under different discounting scenarios, you will have certain aspects called experimental discounting, naive discounting, sophisticated high probability discounting, etc.

I am not discussing much on it. I am sure by reading this if you have any difficulties, I will be happy to address it later. And hence the last part of this lecture is on behavioural welfare economics. How best to judge whether an intervention benefits or harms a person with time-inconsistent preferences. Some of the assumptions of traditional welfare economics no longer apply, as interventions might benefit some selves within a person while harming others. Some of the other important parts of the discussion of behavioural economics are called the revealed preference approach; sometimes, we count for the long-run preferences and other guidance we have clearly mentioned, which I think need not be read between the lines.

I hope you will follow and rest. I will take it up during the discussion. So, we are just presenting here which utility functions should be maximised in the case of time-inconsistent preferences. We have given a revealed preference approach, maximising long-run utility, the dictatorship of the present, hot brains invalidity, etc. Please follow Jay Bhattacharya's chapter number 24.

Rest of the discussion, we have made it. I think it is not right to discuss everything. It is up to you what you are going through. So the last component is part of the welfare economics, but little departure from that is Pareto self-improving commitment mechanisms. However, Bhattacharya and Lakdawalla (2004) proposed a more cautious approach to government intervention for time-inconsistent preferences. In this commitment, the mechanism presents self-rives for the future self. For the future, when discounting is attached, sometimes the bribes to reserve and make it consistent for future actions are usually made. Hence, commitment devices are called Pareto self-improving.

So, for the rest, I am not discussing much. I am sure you must have got so many directions for your thinking and we have cited the respective book and will be highly useful for your understanding. So, in unit 7, we will start with the economics of health systems. That is all. Thank you.