[SQUEAKING]

[RUSTLING]

[CLICKING]

FRANK SCHILBACH: OK. So let me sort of just recap what we discussed last time fairly quickly, and then I want to move to empirical evidence on a variety of settings. We might not get through all of the slides. That's fine. In that case, we'll just discuss some of this in recitation.

So let me sort of recap what Kahneman and Tversky, in their 1979 article, were proposing based on a bunch of experiments and empirical evidence that they had collected. So their theory, it was called prospect theory what they proposed. Versions of prospect theory is essentially versions of reference dependent utility, have been used or used prominently now in economics.

So the first thing that they proposed was, what matters, what the carrier of utility is, is changes rather than levels. That's to say it doesn't matter for you necessarily how warm it is. It matters kind of what's the change of temperature compared to yesterday.

It doesn't matter that much how much money people have in total. It matters how much that changes relative to what they had previously. More generally, what matters for people is essentially a certain consumption or the like relative to reference point as opposed to in absolute terms.

Second, loss aversion, this is losses loom larger than gains. And we had some evidence of that in the last lecture. That's to say, if you lose some money or some consumption or anything else, grades, et cetera, a loss relative to either your status quo or to your expectation looms larger, is more important, hurts more than a gain of the same magnitude in the positive direction.

And number three, which we talked about quickly, is what's referred to as diminishing sensitivity. That is people are risk averse in the gain domain, but risk loving in the loss domain. That's to say, for example, if you think about distance, time, chance, and the like, going from 0 to 1 or from 1 to 2 or from 2 to 3 is more important for you than going from, like, 100 to 101, 101 to 102, and so on.

Essentially, the further you go away from your status quo, your reference point, any marginal change is diminishing, right? And that's true for both the gain domain and the loss domain. So these are sort of the main three characteristics related to what Kahneman-Tversky called the value function.

We can think of this as essentially version of the utility function. There's a fourth characteristic, which is probability weighting, which we're not going to talk about at least for now. Are there any questions on these three things so far?

OK. So now, prospect theory is then what Kahneman and Tversky were proposing. They were essentially saying, instead of having concave utility, which I showed you last week, instead your utility function may look like this. And what are sort of the features of this utility function?

What are the three key features that I just showed you? How are they showing up in this function here? Yes?

AUDIENCE: C minus [INAUDIBLE] is the change?

FRANK SCHILBACH: Right. So the carrier of the utility function-- so what we have here is c and r. c is like consumption. That could be anything.

That could be apples. That could be bananas. That could be sort of how much money people have available to consume overall.

The carrier of the utility function is not c itself. It's c minus r, so it's c of relative to some reference point r. That's exactly right.

And if r is the status quo, if r is how much we have right now or the person has right now, c minus r is the change relative to the status quo. Notice that r-- we're going to talk about this a little bit-- could be also other things. It doesn't have to be necessarily the status quo.

It could be also people's expectation or their goals or their aspirations for the future, right? The key part is, however, what matters is-- this is the first thing I was saying. It's changes rather than levels, changes relative to some reference point or consumption relative to some reference point. That's number one, yes. Yes?

AUDIENCE: The curve flattens out, which is diminishing sensitivity.

FRANK SCHILBACH: Exactly. The curve flattens out in both directions. That's diminishing sensitivity. It's essentially concave in the gain domain, in the domain where c is larger than r. And it's convex in the loss domain where c is smaller than r, right?

And that's exactly the issue that essentially the first, the marginal change, going from, say, 1 to 2 is relatively large compared to a marginal change going from 10 to 11. That's both going in the right direction in the gains domain and the left direction in the loss domain. Yes?

AUDIENCE: For the loss aversion, the left side is steeper than the right side.

FRANK SCHILBACH: Exactly. In particular, there's a kink in this function. When you look at 0, where c equals r, the gain and loss domain intersect, there we have a kink in the value function, in the utility function, which essentially exactly is the loss domain, the loss aversion which is like going to the right is less steep than going to the left. Put differently, if you lose, if you're sort of below the reference point, that's more painful than being the same amount of units to be above the reference point.

That's number two. That's essentially exactly the loss aversion. So I just wrote down all of that.

Again, let me repeat. Carrier of the utility changes relative to the reference point-- excuse me-- rather than levels. Second, there's loss aversion. There's a kink at 0 in this function. And three, there's diminishing sensitivity, which is concavity in gains and convexity in losses.

Any questions on that? Now, a key question here is-- I want to sort of flag this. We're going to talk about this a little bit at the end of the lecture. We're going to talk to this a little bit in the next problem set is kind of like how is the reference point determined. And does it matter?

As I said before, in Kahneman-Tversky's work, a lot of the reference point is the status quo. So they essentially postulated the status quo is what really matters originally. I think people have moved toward saying the reference point.

And this is what Koszegi and Rabin and others have written down in their models of reference dependence utility and recent more economics work is what really matters is expectation. So what do you expect to consume or to have and so on? That matters. That sometimes coincides with the status quo.

For example, if you have a house, the status quo is that you have a house. You probably assume that you have a house in the future. These things coincide.

If you think about wages, et cetera, what seems to matter often is not so much what people's wages are right now. What matters is what wage gains and so on do they expect to receive in the future. And they evaluate their future, their outcomes in the future, not necessarily to the current wage, but rather what they expect they would get in the future.

OK. And so here's an example. And you'll have some problems set questions. Again, this is a problem set three-- which is not posted yet, but will be-- of that kind, which is you might have reference dependent utility over-- this is just a very simple example-- shirts and money.

So you have essentially two different domains. You have, essentially, losses and gains over both of those domains. You have a reference point, which is rs, is how many shirts you might have. You have a reference point, rm, how much money you might have.

Now, what's important here is that, essentially, when you think about buying a shirt or selling a shirt, there's going to be two dimensions which you have to sort of consider. And when you think about the endowment effect of [INAUDIBLE] and so on, you have to consider not only the losses and gains and shirts, but also the losses and gains and money.

So that's to say, if you're trying to buy something, you're going to get a gain in shirts relative to the reference point if it's unexpected. But you'll also have a loss in money. Similarly, if you're going to sell a shirt, you're going to have a loss in shirts, but a gain in money. And these things then interact.

Now, what's the value function? The value function, as I said before, is usually concave in the gain domain and convex in the last domain. There's a kink at 0. It's steeper on the left than on the right. Usually, we think the relative slope is about 2, 2.5, OK?

So one version of that would be this function that I wrote down. Again, there will be some problem set questions, et cetera, sort of to clarify that. But one key question here is, then what are the different domains?

And that's kind of a question of mental accounting. We'll get to this in the second half of the course. The question's kind of like, what are the different categories?

Do you have shirts? Do you have pants, sweaters? Or is it just for clothes overall?

Or when you think about earnings and consumption, et cetera, is it daily consumption? Is it weekly consumption? Is it monthly consumption?

So there's lots of questions on how to exactly specify this utility function. These questions are mostly unanswered in the literature. So for now, for us in our purposes, we're going to essentially assume there is a value function given and then sort of work with that. Any questions on that?

OK, great. So now, we're going to talk about a number of different applications. We talked a little bit already about the endowment effect and about insurance. I'm going to skip this. There's some of this already in recitation in the problem sets.

We're going to particularly talk about labor supply and employment decisions, essentially how much do people like to work. And is effort or people's work decisions, are they reference dependent? We're going to talk about finances, what was mentioned last time already about investment decisions. When do people sell and buy stocks?

We're going to talk about housing. When do people decide to sell or buy a house and at what price? We're going to talk about sports, in particular marathon running and golf.

There's some papers on domestic violence we're going to talk very briefly about. And then we talk a little bit about firms. How do firms think about pricing and so on? What is sort of the market response to reference dependence?

That's to say, given that we know there's lots of reference dependence in the world, now, as a firm or treating other people, how should we think about, how does that affect, our own behavior or how maybe firms interact with us? OK. So let's start with labor supply. Let's start with a very simple example.

Suppose there's a worker in the following situation. She can freely choose how many hours she works every day. And there are frequent temporary changes in her hourly wage.

Now, there's different relationships between wages and hours per day. You could always work the same number of hours. You could work more hours on the days when wages are high.

Or you could work fewer hours on days when the wages are high. What does sort of standard theory say? What should you do? Yes? Two?

AUDIENCE: Two.

FRANK SCHILBACH: Why is that?

AUDIENCE: Because that maximizes your expected value for time.

FRANK SCHILBACH: Right. So if hours are effortful, you usually don't like to work. You should work during the hours when your payment is the largest. That's right.

So what about option number one? Why might option number one be optimal? So what you're saying is exactly right. It depends a little bit on something else. And what is that? Why might you choose number one anyway?

AUDIENCE: Habit-forming is nice.

FRANK SCHILBACH: Yeah, there could be sort of habits, exactly. Or it could just be that it's really effortful to work 12 hours in one day. Maybe there's kids at home, or maybe it's just really tedious to work. At some point, you just want to go home and do other stuff.

So it could just be that working beyond, say, eight or nine hours per day is really tough to do. So then you might say, I'm always going to work eight hours. I'd love to work more, but it's difficult to do.

So essentially, it's just to say, if the function of the effort as a function of hours is convex, then you might sort of keep it the same. Surely, what you don't want to do is number three, working fewer hours on days when wages are high unless effort costs are particularly high on those days. So it could be that it's really super hot. Or it could be it's tedious to work on those days. And you might say, then you don't want to do it.

But assuming that's not the case, you kind of want to avoid this. Because for the same number of hours, you're going to make less money overall. And so here's a concrete example.

Suppose wage is 5 hours an hour on day one and 10 hours a day on day two. So there's three strategies. You can work 8 hours on both days. You can work 6 hours on day one, 9 hours on day two, or the opposite, 9 hours on day one and 6 hours on day two.

So if you do that, you can sort of calculate how much that is. You can essentially work 8 hours on both days. You get 120 hours. You can work 6 hours on days one and two, which makes $120 as well. Or you can essentially do the opposite, which makes you $105.

This is what I was saying. Option three doesn't make a lot of sense unless effort costs are particularly high on certain days when the wages are high. We're assuming that away for now.

And so now option two-- and this is what you were saying-- essentially saves you an hour overall. You work only 15 hours instead of 16 hours. And you make the same amount of money.

Now, unless the ninth hour is extremely costly for you to do, you might not want to do that. OK. Now, why might you do something else instead? Or where does reference dependence come in here? Yes.

AUDIENCE: I see on the high wage day you make more than the less wage day, so I feel like stopping maybe.

FRANK SCHILBACH: And why would you stop? What's causing you to stop?

AUDIENCE: [INAUDIBLE] wages higher relative to [INAUDIBLE].

FRANK SCHILBACH: Yeah. Yes. And so what are you evaluating? Or what's the-- or what happens, for example, if you work only 6 hours on a different day? How much do you make on the sixth hour day, I guess, which would be $30, right? And so what are you comparing that to, I guess?

AUDIENCE: You're comparing it to the actual money you made at the end of the day.

FRANK SCHILBACH: Right. But so suppose you, on average, want to make a certain amount of money, which is $50, $60 and so on. Now, if on some days you make a lot of money and on some day you make very little money, you might sort of evaluate that separately and say, on that day, I'm essentially in the loss domain. I'm below my target or below my expectation.

And so if you evaluate your utility that way, you might sort of not want that because it feels essentially you're below a certain threshold. It feels kind of like a loss relative to your expectation and so on when you might be inclined to work a lot of hours. Instead, on the days when you make a lot of money, why might you stop? Yes?

AUDIENCE: You might have a target that you expect to meet every day to cover your expenses. And if you feel like the work [INAUDIBLE] reach that target, you might [INAUDIBLE].

FRANK SCHILBACH: Right. So if you target, your reference point, is essentially a certain number, you might reach that target quickly because your wage is pretty high on that day. And once you reach that target, you might say, well, now utility function is relatively not very steep anymore relative to being in the loss domain. So it's flatter.

So then you might just stop relatively soon because, essentially, any marginal earnings are not really valuable for you anymore. OK? Any questions on that or comments?

So why do we want the wage changes to be temporary here? What's an issue here when you sort of try to look at this in the data? Suppose I had persistent wage changes. Yeah.

AUDIENCE: So you can have a frame of reference?

FRANK SCHILBACH: Yeah. You want to kind of keep the reference constant. So in some sense, if wage changes are permanent, then you get essentially income effects. You'll be a lot richer overall.

If they're only temporary, essentially, you can sort of argue that, essentially, your expectation should be the same. And once you reach, once you have a lot more money, the neoclassical model should actually say that there should be income affects. Essentially, the neoclassical model says, you should essentially aggregate all of your income and say, it doesn't really matter whether you earn it on Monday, or Tuesday, Wednesday, or Thursday.

You should look at how much are you earning overall depending whether you earn sufficiently much, you're going to work fewer or more hours. Now, if you earn a lot, because your wages doubles or whatever, you might actually work few hours not because you reach a reference point on a given day. It's just because you got a lot richer, and then you decide it's not worth for you to work that much.

So we're kind of trying to avoid that. We're trying to have only temporary changes, which is to say, for given wealth overall on any given day, it shouldn't matter whether you earn the money on Monday or on Tuesday. So essentially, if the wage happens to be really high on Tuesday, you should be working more, earning more, on Tuesday as opposed to on Monday.

Now, what I was saying is, if you're reference dependent, you might actually care about this. You might care about on Monday you didn't reach your target. Therefore, you want to work more. On Tuesday, you reached your target very quickly. And you work less even though the wage is actually really high. OK.

Now, strategy one might be optimal even in the neoclassical model if effort costs are convex. This is what I was saying is, if it's really sort of costly for you to work 9 hours, you might say, I always work 8 hours. I want to have a certain amount of money for my children and so on.

So the extra hour, if that's really, really painful, you might not want to do that. We don't think that's necessarily the case in so many situations. The question is, can we really say that strategy three-- that's the strategy of doing the opposite, of working essentially a lot of hours when wages are low and few hours when wages are high. Can we really say it's a mistake?

Well, it depends on kind of whether the effort costs are correlated with wages. So if cab drivers, for example, make really high wages on some days and low wages on other days, it could just be on low wage day it's much less effortful to drive around. So you would do more hours.

It turns out, when you actually ask cab drivers, they actually prefer busy days. They actually prefer it when there are customers as opposed to just driving around and looking for people. So we don't think that's actually true. But in principle, you would have to sort think about that.

Now, there's a long literature starting with Camerer et al. On cab drivers. A lot of that essentially is pre-Uber, like collecting trip shifts from cab drivers. Now, there's lots of like Uber data that's essentially much more powerful in some ways. So there will be probably more papers using Uber and Lyft, et cetera, data on that.

But what Camerer et al. did at the time was they essentially looked at typical cab drivers that rent their cab for 12 hour periods for a fixed fee. And within this 12 hour window, a driver can choose their hours freely. So you just get your cab that's not yours. You rent it for the day. And then you can essentially choose how many hours you want to work.

And their wages, how much money they make in any given hour, varies by a lot. The weather varies, the subway breakdowns, conferences and so on and so forth. There's lots of variation in how much money you make on a given day.

So then they have trip sheets that look at how long cab drivers work and their overall earnings. And so they can essentially back out the wages from each day and then look at like how much do people work on days when wages are high versus days when wages are low. And then they essentially find the basic finding. And that's a finding that's sort of been contested in the literature many people have found or confirmed subsequently. And others have not, but I think eventually people have sort of settled on this.

Hours are negatively correlated with wages. So when wages in particular are unexpectedly high, cab drivers tend to work fewer hours. And again, this is not for permanent changes, but for transitory changes. Surprisingly, on a given day people get more money, then drivers work few hours.

And that's very hard to explain for the neoclassical model. Because, essentially, you shouldn't care about whether you make the money on Monday, on Tuesday. As I said, you should care about how much money you make overall and how many hours you work.

And so it's very hard to explain this. And sort of the explanation that Camerer et al. and others were testing or arguing is essentially this has to do with reference dependence. And so what's being evaluated in a reference dependent way? Or how do we think about this? Yeah.

AUDIENCE: I have a question.

FRANK SCHILBACH: Yeah.

AUDIENCE: How did they rule out the possibility that maybe there is reverse causality maybe on a day where none of the cab drivers want to work that much because it's supply and demand that they just go on?

FRANK SCHILBACH: So that's to say effort costs are high. So usually, it's to do with other drivers. So let me actually get through-- so let me defer this for one second.

I have a slide on confounds. And then we can see the rest of your question and then get back to that. But that's a good question.

So what is being evaluated in reference-dependent way? What are people looking at in terms of where's the reference point in the evaluation here? Yes.

AUDIENCE: I guess, if you're a cab driver, you kind of say, oh, I want to make this much money today. And then you just kind of work until you feel like you've made enough, and then you just stop.

FRANK SCHILBACH: Right, exactly. You have to pay your fixed fee for the day or for the month or whatever. But there's an implicit fixed fee for the day. So you kind of want to make at least that much money to make not a loss. You probably have some positive target in some way in saying, like, I want to make pay back for my fee plus you want to make some money for the day and minus sort of expenses.

And once you reach that target, you are in the gain domain. Below that, you are in the loss domain, right? And so the daily income essentially-- and that's essentially sort of money after paying back the fee, but you could also get-- it's essentially what's being evaluated in the reference-dependent way.

What's the reference point is some daily target that you have. Often, it's expectation and so on and sort of, essentially, how much you think you will make. And then what's the feature of the value function that explains the phenomenon?

Well, it's loss aversion. If you're falling short of the target, essentially your marginal utility-- when you drive another hour or another trip, the marginal utility that you get, since the value function is very steep below the target-- is very high. Once you reach the target, it's very flat. And then essentially you tend to stop. Does that make sense?

AUDIENCE: Yeah.

FRANK SCHILBACH: OK, great. So the main takeaway is, so if drivers often stop at their daily income target, driver with a higher wage reach their targets faster. And they work fewer hours. Again, that's variation within drivers across days.

And sort of there's lots of subsequent work and debate regarding this finding. The debate is still ongoing. For example, one recent paper looks at tips that drivers get unexpectedly.

So sometimes drivers get large tips, sometimes get small tips. It depends a lot when in the day they receive the tip, if they receive it really early versus late, if they sort of get to their target. And essentially, the target seems to be adjusting over time.

But overall-- and this is sort of getting a little bit at your question-- we think it's not sort of aggregate supply. But the debate is still ongoing. But overall, we sort of think that lots of labor supply decisions, when people have daily decisions of how many hours to work and their wages vary, depend on reference points and might sort of potentially be at least suboptimal. Or put differently, people could work fewer hours and try to sort of adjust their overall amounts.

For a while, I did this. You can ask your Uber and Lyft drivers what they're doing and so on and see whether they're a reference-dependent driver, sort of where they have reference-dependent preferences. Now, what are sort of potential alternative hypotheses?

One question, one issue, could be liquidity constraints. This is, for example, if you just don't have enough cash. If you have to pay back your fee for the day or for the next day, you might want to not work only very few hours on a given day.

It turns out that drivers who own their own medallion exhibit the same patterns. There could be things like fatigue. Let's just say it's really tedious to work on certain days when wages are high. We don't think that's going on in part because drivers themselves, they say, it's actually easier to drive with more passengers.

Again, recent papers, in fact, can also control for this and so on. So we don't think it's actually fatigue. And this is, I think, what you're saying. The last one is unobserved shocks, so some shocks that affect all drivers' labor supply at the same time.

Example, there are some days in which all drivers get the flu. Fewer drivers will work. And those who will work work fewer hours. And those who work get higher wages.

That's a little bit trickier for them to rule out. In part, there's other papers, other studies afterwards, that sort of try to get at this. Usually, yeah, for this specific data, that's hard to do.

I think for the other data where people have essentially not just daily-- so this is essentially trip sheets. So what they're using mostly is daily wages overall. They don't even have the wage.

They only have the overall earnings and then the hours. And then they sort of compute the wage dividing the two, which causes some other trouble. But once you have Uber data, once you have specific trips and particular also tips and so on, you can look at, on a given day when I get a high tip versus a low tip, you can predict, essentially, how much I'm going to earn on a given day.

So suppose you predict that I'm going to earn $100 in a given day. Now, I have, say, $50 or $60. Now, I get a large trip and a tip and so on that gets me over that threshold.

You can look at whether I stop. You can look at the exact same thing. When I have only $20 and I get a large tip, do I stop and so on?

So you can essentially control for all of that and then do within driver comparisons, like for trips that happen to be large or small that you happen to get in a given hour. And then you can sort of deal with overall market conditions. I think even better, in the future, there will be sort of experiments and so on where you can look at when Uber and Lyft try to incentivize their workers and so just, say, essentially, sometimes pay people more and less randomly, sort of explicitly randomly, because they want to kind of learn about how to best incentivize their drivers.

And then you can control for everything because it's explicitly random whether a certain driver gets high versus low wages or sort of trip fares. Yeah. OK. Any questions on the labor supply? Yes.

AUDIENCE: I'm a bit confused about the unobserved shock. Because if you get a really large tip, that doesn't necessarily predict that the rest of the day you'd have higher wages if you kept working. [INAUDIBLE] you get this really high tip, and then you would be like, oh, today's a lucky day. I can stop early. But if I have worked more this day, I wouldn't necessarily be making continuously more than normal.

FRANK SCHILBACH: Right. So in the unobserved, in the large tip example, the assumption is exactly-- or what they show in the paper. This is subsequent work, not this specific work. What they exactly show in this type of paper, these are sort of random events.

In a sense, it's precisely not predictive of your future earnings. It's random. Now, one interpretation that you have is to say, well, it could be that you kind of have some expectations about your future earnings. They could be particularly high or low. It's like, I got my lucky day and so on and so forth.

That is hard to rule out. In some sense, if you had rational expectations, that's hard to explain for the neoclassical model. What's harder to rule out is to say, you know, I now think I got my lucky draw for the day.

And that's it. And I'm not going to get any lucky draw again. Let's just call it a day. That is hard to rule out.

But what is hard to explain for the neoclassical model-- I think we can sort of reject-- is to say, if you just think this is a shock, which really in reality it is and you just happened to get a bunch of money on a given day just randomly, then the reference-dependent model can sort of explain why you stop early. Because it just gets you over the reference point. The neoclassical model should just say, depends on essentially how many hours you want to work on a given day.

It's nothing to do with a target. Because essentially, again, it doesn't matter whether you make money on Monday, or Tuesday, or Wednesday. You should just care about the overall amount of money that you make overall. But that's a good question. OK.

So now, a second paper is on the housing market. So what is the natural reference point for housing market? Or how do we think about housing prices? Or how do you think about-- I guess a few of you will own a house. But if you owned a house, how would you think about selling a house? What is an actual reference point? Yes?

AUDIENCE: Whatever it was before or how [? changes ?] [INAUDIBLE].

FRANK SCHILBACH: Yeah, so exactly. So the previous purchase price, it turns out it's a very, very salient thing for owners. People really know how much they paid for their house. It's a huge expense in their life.

They really remember it was like 300,00, 500,000, a million, et cetera. They know exactly how much they paid. And when you even ask people, the majority of people know exactly how much they paid for their home.

Now, one claim is that loss aversion makes people unwilling to sell their houses at a loss. And so what they would then do is they ask essentially for higher prices, if a loss, relative to their purchase price. And let me just show you exactly what I mean by that.

Genesove and Mayer have Boston condominium data from 1992 in 1997. Luckily for them, there's lots of variation or fluctuations in the housing market during that time. So the housing market went up a lot, and then it went down a lot and went up a lot.

Now, suppose you have two sellers, A and B, who both want to sell their home in 1994. Now, what we can do is we can look at these two people. Suppose they have very similar houses based on observable characteristics and location and so on and so forth.

So once they have really comparable houses, we can all look at seller A, purchased their home really early on, in 1989. That person happens to be quite unlucky because they just bought the house really at the peak of, I guess, the housing boom at the time. Or seller number B, who purchased in 1991, that person was relatively lucky. They bought essentially at a time when the housing market was relatively low and appreciated quite a bit.

So now, we can look at these two people and ask the question, is seller A or seller B more likely to sell their house? And the hypothesis is that seller A will sort of view this as a loss. This seller will essentially just say I'm losing money here. I don't want to sell. And that seller might essentially ask for a higher listing price and wants make more money for this house because they don't want to make a loss on that sale.

Well, seller B says, I'm actually gaining money anyway. So let's just sort of post whatever you think is actually the expected market price. I might be happy to sell at a lower price compared to seller A.

OK. So one thing we can look at essentially are listing prices. How much do people want for the houses? The second thing they can look at is actual sales prices. Are you now selling this at a higher or lower price?

And number three, we can look at how long is the house on the market. How long does it actually take to sell it? That's a quite costly thing to do to have your house on the market for quite a while because, essentially, often people then don't already move somewhere else. Or they can't really live in the house because they have to sort of show it and make it available for showings and so on.

So it's a costly thing to do. You really don't want to have your house on the market for several months. But is sort of the broad idea clear of what we're trying to do? OK.

So what predictions do we want to test? We want to test whether house owners are reluctant to sell their house when the current market price is below the purchase price. So the ideal specification is essentially the following.

We look at the list price on the left-hand side. And then we are going to run a regression that looks at some constant-- that's just kind of time trends, et cetera-- plus a beta, which is the coefficient of interest. Or one coefficient of interest is of the actual market price. How much is the thing worth? And then delta on the loss is how much do you lose relative to your purchase price.

Now, if people were not reference-dependent, what should we find? Or what would be the predictions? The neoclassical model, what should we find here? Yes.

AUDIENCE: We should find that delta 0 [INAUDIBLE]?

FRANK SCHILBACH: Exactly. Delta should not matter. It shouldn't matter how much you lost or gained in that house. What should matter is what is the actual market value. You should essentially try to be willing to sell it not.

Beta could be-- it doesn't have to be 1. It could be everybody pays above the actual market. There's some housing bubble or whatever. Beta could be 1.1 or whatever you might be. That depends on, essentially, sort of aggregate conditions and so on.

But delta really should not matter. When I'm trying to sell you a house, you should ask, what's the actual market value? And I should, essentially, then based on that, put it on a market on that listing price. But what might be the case is that the loss actually matters.

Now, one problem here is that the actual market value is not observable, right? So I don't actually know what the market value is because that's endogenous. That's part of the transaction. So what can I do instead? Or how do I do this? Yes.

AUDIENCE: By asking people, would you take this trade? And then see what they say. [INAUDIBLE].

FRANK SCHILBACH: Right. So you can look at actually the market outcome overall. You can look at who buys it and what's the actual purchase price. Now, that might also be endogenous to the listing price, right?

So if you think you know that people who are loss averse are listing their houses too high relatively compared to what the market value actually is, it might actually be sold at a higher price. So that's hard to interpret. It could just be that, if you list it at a very high price and wait for a long time, you also sell it at a higher price.

But it doesn't mean that that's actually worth that much. It just means that you happen to find a buyer who happens to be willing to pay a lot. And that's more likely when you wait for a long time, which is not necessarily optimal, because it's actually quite costly to do that.

But you're saying something else which is asking them about what they think. But what are the characteristics that we could look at? Or what data could we look at?

If you had Zillow data or data on essentially a bunch of these apps where you can look at houses, what data could you get? Yes.

AUDIENCE: You'd look at the houses in the neighborhood, similar houses that sold recently.

FRANK SCHILBACH: Exactly. What Redfin and Zillow, et cetera, do these days is essentially they have these algorithms that try to predict the actual market sales price. And what they tend to do essentially is look at, exactly as you say, surrounding houses that are similar in some characteristics.

They look at the square footage. They look at the number of bathrooms and rooms in general. They look at sort of location and so on and so forth.

And then you can predict how much-- and sort of they look at all the time trends and so on. How much is the actual market value? But essentially, fundamentally, it's a prediction exercise. You can try to predict what the actual value is. And that's exactly what Genesove and Mayer do.

They do some more fancy things that try to get it other unobservable characteristics and so on. But the essence of this is exactly the prediction exercise where they say, let's just look at the characteristics of this house. Let's try to predict what the market value is and then look at the loss, which is essentially the difference between the previous selling price and the expected selling price truncated from 0 because, otherwise, it's a gain.

And then we can look at does it really seem that, when people are in the loss domain, when their loss is positive, are they now selling their house or trying to sell their house at a higher price? Yes?

AUDIENCE: How do you account for something like recent renovations since the last listing and relative to any other similar units or houses or [INAUDIBLE] [? nearby ?] [INAUDIBLE]?

FRANK SCHILBACH: Right. So that's tricky to do. And I don't think they have this in their data. So what you'd have to assume here, and that's perhaps reasonable, is to say that when you look at sort of this picture that seller A and seller B did not do differential renovation depending on when they bought the house. Right?

So if you said, it's fine if people have done renovations. For example, this is what I was saying about the beta on the actual market value. If you systematically underestimate or overestimate how much people renovate and so on, or maybe the housing market is really hot or whatever, that's OK.

The main issue is that can't be correlated with the loss here. So if it's the case that people who lost a bunch of money in terms of their housing prices sort of tanked, if those people have done more or less renovations, then you're in trouble with your estimates. Yeah.

AUDIENCE: Is the expected selling price the estimation of actual [? work ?] value?

FRANK SCHILBACH: Correct.

AUDIENCE: OK.

FRANK SCHILBACH: Yes. So now, what Genesove and Mayer find is-- and there's more detail to that. But essentially, the main finding is-- and that's a fairly solid one, there's a bunch of different specifications-- a 10% increase in a prospective loss. So if this loss coefficient, the difference between the expected selling price and the purchase price, if that's 10% higher, then essentially the list price is 2.5% to 3.5% higher.

So people list the price, the house, at a higher price. If the house is at a loss compared to a similar house who's not at a loss or who's in the gain domain, these effects then translate into higher sales prices and a lower hazard rate of sale. That's to say people actually sell it at a higher price. So in fact, it's hard to say here what's optimal versus not.

It could be that, overall, people are like, it's actually a good thing to do. That depends a lot on, essentially, your opportunity costs of money in terms how costly is it for you to keep the house on the market for a while. But essentially, people have a lower hazard right of sale.

That's to say it just takes them a lot longer to sell the house. That tends to be very costly to do. But if you just otherwise would have your money in the bank and you have another place to stay and you don't really care, maybe then that's fine.

But we surely have real effects in terms of people list their houses at higher prices. People sell them at somewhat higher prices. And people also keep them longer on the market. OK. Yeah.

AUDIENCE: Is this the same analysis if it's gains on the value of the house?

FRANK SCHILBACH: So essentially, what we're doing is we implicitly comparing losses versus gains, right? So the gains here would be in the actual market value already as it is. But essentially, what you're implicitly doing is, when comparing implicitly, this is what I was saying here. When you look at this picture, implicitly what we're doing is we look at people who are losing money compared to people who are gaining money. And explicitly or implicitly, we're asking, is the increase and the gain sort of predictive of that-- sorry, the increase in the losses predictive of your listing price?

Now, it's hard to do this at the same time for gains because, essentially, an increase in the market price overall that's sort of collinear. In [INAUDIBLE], essentially that's hard to separate. You could do the same analysis, and you wouldn't find that for the gains in part because essentially explicitly what we're doing is incurring losses to gains. OK.

OK. So then there is another piece of evidence that sort of tells us perhaps this is not optimal. If you look at people who are owner-occupied compared to investors-- so there are people who essentially invest in houses. And they sell houses. And they sell lots of houses over time.

Those people have much lower endowment effect, if you want, for houses. So they exhibit this behavior a lot less. But people who live in that house, who bought that house, for them it's mostly the only house they live in.

It's the main purchase that they have. For them, it's essentially their house for which they don't want to make losses. For them, these effects are twice as large compared to the investors.

And that's perhaps some evidence that this is not optimal behavior in a sense of sort of the professional investors. They presumably know pretty well how to price their houses. So if they do this behavior less, presumably that's a sign that there's some form of a mistake here going on.

Second, there's some evidence-- and John List has some work on this overall-- to say that experience can mitigate reference dependent effects. Essentially, if you do a lot of trading, if you sell a lot of houses and so on, then you might still feel losses and gains, but you might sort of have a lot more experience with this. You kind of know that this is happening sometimes.

And you might be less prone to these types of effects because you kind of know that you shouldn't be doing this. You shouldn't sort of have your feelings of losses and gains get in the way of making profits. So there are some people who would argue that this is very much consistent with markets over time or exposures to markets and several predictions. Experience makes some of these effects go away. And John List has some separate evidence on this on traders of cards and so on. OK.

So now, next, we're going to talk a little bit about finance and stocks. So interestingly-- yeah.

AUDIENCE: Sorry, on the previous study, why [? is it ?] said reference-dependent and not some informational effect, that I'm a home owner and I think that my house is worth this amount. And I just [INAUDIBLE] [? anchored ?] to believing that that's the amount.

FRANK SCHILBACH: Right. So one thing you could say is that-- so what you always have to make the argument is people who are at losses compared to who are at gains. So you look at our investor A and B. They might have additional information on how much the house is worth.

So it could be, for example, that seller A knows a lot about this house. It's very beautiful and so much light and this and that. And, therefore, they paid a lot. Therefore, they have private information that it's worth a lot. Therefore, they list it at a really high price.

So there are some specification here that-- look at this. What you see is this is columns two, four, and six, which is the residual from the last sales price. What is that?

That's essentially the difference between at the time when previously the house was sold, what was the prediction of the market price then, and how much was it sold. So it's kind of like, how much did you overpay, if you want, relative to what we expected at the time? Presumably, that's reflective and, again, using the same prediction method.

So if you thought, you know, it's really beautiful and lots of windows and this and that, lots of light, and really quiet and so on, if you overpaid at the time, that should then sort of be predictive of the listing price. And sort of controlling for that then should make this go away. What you see, however, there's some of that perhaps going on.

If you compare, for example, columns one and two, you see that the effect goes down a little bit. But it's still there quite a bit. This is why I was saying 25% to 35%.

That is exactly right. That's a big concern. And there's a bunch of sort of robustness, et cetera, checks in this specific study. But that's exactly right.

There could be sort of unobservable information that the owner might have about the house that is not in Zillow or in any sort of Redfin, et cetera, predictions that's available for the public. That's a great question, but I think it's, to the extent that that takes care of it, sort of the authors have thought about that. Yes.

AUDIENCE: On the following slide, when you talk about the differences, how do you control for the selection bias about the people that may be the ones repeatedly selling houses exhibit this less and, therefore, stay in the market versus a change in those individuals' behavior?

FRANK SCHILBACH: Right. That's a great question. So the question you're asking is essentially to say-- and it's, in fact, a great sort of segue into behavioral finance, which is to say, suppose there are some people who are really sophisticated. They don't have certain behavioral biases. Maybe they're not loss averse.

That makes you a better investor, say. And, therefore, you stay in the market overall. I think, from this observation that I have here, I cannot tell you is it experience or is it selection.

So the question kind of is, when people are investors, do the effects of reference-dependence of gains and losses go away over time? Essentially, maybe the first, second, third time they feel really a loss in terms of making a bad investment. But in house number 20, I'm just like, that's as usual. And I shouldn't sort of really care very much.

Is it that this goes away? Or is it that the people who are particularly loss averse and sort of essentially engage in this type of behavior in terms of listing too high of a price for losses, these are sort of bad investor in the housing markets? And they sort of are essentially driven out of the market. So that specific setting I don't think we can necessarily account for that.

I think in the studies by John List, it's very much people argue it's about experience. But again, there also some part could also be selection I think. So I think, in some sense, either way I think the evidence that the investors are doing this behavior less sort of tells us something about this is probably not at least financially optimal for you to engage in this type of behavior.

It might be privately optimal. In some sense, if you really feel at selling your house at a loss, you should probably list it at a higher price because that sort of limits your losses. That's just what a utility function looks like. It's not necessarily suboptimal in the sense of how you feel afterwards.

It might be suboptimal in terms of how much money you make or how much money you have eventually on how much you pay for keeping your house on the market and so on for an extended period of time. OK. So did that answer your question? Yeah, OK.

So behavioral finance is an interesting field because, for quite a while, economists thought that sort of neoclassical assumptions are, in fact, most likely to hold in financial markets. And why is that? And some of this already I mentioned, but why are financial markets particular-- why might one think that financial markets are particularly efficient? Yes.

AUDIENCE: Well, you might think that financial markets are very competitive. And so it's actually the ones who can get rid of their behavioral biases that benefit the most and stay within financial market.

FRANK SCHILBACH: Exactly. So it's very much sort of the Chicago economics assumption is to say, so financial markets are extremely competitive. If I'm an investor who has various behavioral biases, presumably I'm going to lose some money one way or the other. Well, if markets are really competitive, in the long run I cannot stay in this market without sort of being driven out.

So essentially, the market favors sort of results-oriented, rational, and selfish behavior. So people who are not rational and so on and so forth will be eliminated from the market eventually. There's two parts to that.

That's true across firms. That's to say there are some firms sort of better than others. But also, within a firm, if I'm an investor and I'm sort of advising clients and the like-- and I'm sort of not very good at this.

And essentially, I have certain people biases that are not optimal in terms of making money for people. Presumably, I will not be promoted. Presumably, I will be driven out of or fired from the company eventually.

So surprisingly, in fact, finance became one of the most influential and most fruitful applications of the psychology in economics of behavioral economics. There's lots and lots of work in behavioral finance. The reason being perhaps not necessarily because people are-- so some people are presumably driven out of the market, but surely not everyone.

But in particular, because there is a great data in finance. There's lots and lots of daily data in terms of things that you should be doing compared to what models would say. So it's a really great way of being able to test models or test essentially predictions of the neoclassical model or behavioral theories and so on. So that's why behavioral finance has been very influential because there's so much data available for people to, in fact, test theories.

And then why is it that people are not entirely driven out? I think often the case is that, even if you're right, for example, even if you're right that you can predict-- and if you watch some movies on the financial crisis and so on, even if you're right about in the long run the market is going to tank, well, actually it's going to take a lot of money. And often, if everybody is wrong, prices will go up for quite a while. So it's not actually clear that, at least in the short, medium run, we'll be driven out of the market quickly. But that's sort of a separate topic.

OK. So now, one reason why or one way in which reference-dependent behavior might be important in finance is people might be differentially likely to sell winners and hold on to losers, financial stocks. That was mentioned last time as well. So what Terry Odean did in 1997 is he had, in fact, brokerage accounts from the nationwide brokerage house, which had all trades and prices for, I guess, '87 to '93.

In some sense-- a little bit old fashioned in a sense of you shouldn't be an individual trading and so on. You should just hold the stock market or the S&P 500 or some index funds and so on. Here, these are people who hold individual stocks and sell and buy them one by one.

And so during each trading day, then what Odean can do is he can look at, evaluate, each stock in the portfolio and look at this is a loss relative to the purchase price. So you can look at, essentially, the portfolio and say there's losers and winners. He only has data on trading days. So you can look at are they losers and winners when they're being sold.

And he can look at then at realized gains and realized losses. So if you sell a stock and it's essentially above the purchase price, he calls it a realized loss. Sorry, if it's a losing stock, it's sold. It's a realized loss. It's below the purchase price. If it's above the purchase price, it's going to be a realized gain.

Now, one thing you could do is compare the number of realized losses to the number of realized gains. Does that work, or is that reference-dependent? So what did we learn from that? Yes.

AUDIENCE: [INAUDIBLE] people [INAUDIBLE] people won't want to [INAUDIBLE] are losing stock because they're comparing to the price they bought [INAUDIBLE].

FRANK SCHILBACH: Right. So I could look at the realized gains and the number of realized gains and the number of realized losses. But what's the problem with that? That's exactly right, but what's the underlying, what's the problem with this approach? How does this depend on the stock market going up and down? Yes?

AUDIENCE: You're not looking at the magnitude of those gains or losses?

FRANK SCHILBACH: Yeah. So that's a separate issue. You could look at the magnitudes themselves. And you could look at, depending on where you are, how does that matter. But what about just a number of gains and losses? What if the stock market goes up a lot? What are people going to sell or [INAUDIBLE]? Yeah.

AUDIENCE: Well, one issue is that you don't know when or for how long something has been losing. So if it's been losing for long time or gaining for a long time, that might impact the [INAUDIBLE] hang onto it or sell it?

FRANK SCHILBACH: So he does have that. I think I'm asking for something very basic, which is, if the stock market goes up a lot, you'll have lots of winners. So you're going to realize lots of-- if you just sell randomly, stocks, gains and losses, and you just don't care, you'll have much more realized gains compared to realized losses just because your stock market went up a lot.

Similarly, if the stock market went down, you will find that people have way more realized losses compared to realize gains. And it looked like I'm really trying to sell the losers, but it's not I'm actually selling the losers. I just have a lot more losers.

That's all I was asking. I think he has actually the information about the purchase prices. So what he then does is something very simple.

It just looks at people's portfolios and says, how many losing stocks do you have? What's your propensity to sell the losing stocks, which is what you call the PLR, the Proportion of Losers Realized? The same he does for the PGR, which is a Proportion of Gains Realized.

So he looks at each person when they sell something. They look at how many losing stocks do you have. How many winning stocks do you have? And then he looks at what's the probability of you selling any of those depending on they're winners or losers.

So what the main finding then here is that the PGR, the Proportion of Gains Realized, is larger than the PLR. And that's to say that's what they call the disposition effect, which is a tendency to sell winners and hold on to losers. Does that make sense?

OK. And so why do we care about that? Or why is this actually bad? Is it's necessarily suboptimal behavior? Why do we care? Yes.

AUDIENCE: I think you had mentioned in a previous class [INAUDIBLE] sometimes it might be worthwhile to hold on to the winners or someone who's betting on [INAUDIBLE]. But probably shouldn't be an overall bias towards selling losers. And then probably [INAUDIBLE] overall effective strategy [INAUDIBLE].

FRANK SCHILBACH: Right. So it depends on, essentially, how well the winners and the losers are going to do. It turns out, so in principle, you would say, well, winners and losers should have the same expected return regardless of the winners and losers in the past. That's essentially the efficient market hypothesis, just to say past price changes should just not be predictive of future momentum or price changes overall. Because the current price should have incorporated essentially all information that's available at this point in time.

So to that degree, it shouldn't matter actually what you sell. You could just randomly sell stuff. Now, you should not sell a lot.

Usually, there's commissions involved in these trades. So essentially, you shouldn't sell anything that's essentially leading to over-trading. Odean has another paper that shows essentially, in particular, men tend to be overconfident in how good they are at trading. And they tend to over-trade, and that's really costly.

It turns out that, in their specific period, in fact there's momentum. And that used to be the case quite a bit in that period of time, which essentially has to do with the winner is actually doing better than the losers by quite a big margin. That is to say, you should have actually did exactly then the opposite. If anything, you should have sold the losers and keep the winners because they are, in fact, making more money in the short and medium run in that period, OK?

There's also the investors sell more losers and winners in December. This is what you see here. Why is that? Yes.

AUDIENCE: Is it that you can count your losses toward your income?

FRANK SCHILBACH: Exactly, this is for tax reasons. So that actually happens to-- Jim Poterba, who's in the economics department, actually did a paper on this. So there you can essentially realize losses, and that reduces your taxes overall. Exactly.

But overall, essentially what's happening is that people do seem to engage in this behavior. In a pretty striking fashion, they seem to be losing quite a bit of money from that. OK. Let me mention at least the marathon running and perhaps the golf example, and then we're going to move towards prices and firms. How do firms react to these biases?

But what I'm trying to do here is essentially show you a bunch of different settings. And essentially, if you look at different settings in the world, there's lots and lots of different settings where reference-dependence seems to matter. One way or the other, it seems to be important in shaping people's behavior.

So this is a very nice paper about a marathon running finishing times. These are many, many marathons. They have lots of data on finishing times for people.

So the law of large numbers would predict that, if you look at essentially people's finishing times, if people have different talents and so on and so forth, the finishing times should look something like this. OK. Some people are faster. Some people are slower. But overall they're should be some smooth distribution that essentially is like log normal or whatever you want it to be. But essentially, it should look something like this.

So why might it not look like this? Or what might people do instead? Yes.

AUDIENCE: They may say, I'll beat 4:30. And then you might see bunching at certain points, like 4 hours, 4:30, 5 hours, 5:30.

FRANK SCHILBACH: Right. So exactly as you say, it might be that people have reference points not in terms of status quo here and the like. Reference points might be goals or aspirations. You might say, I really want to run the marathon in 4 hours or 4:30 or 4 hours if you want.

And then what the marathon times actually look like is something like this. And in particular, it seems like people have lots of goals of reaching something like-- if you look at the distribution, what you see is exactly as you predict. If you look at the half hour or even the quarter hour sort of points, there's essentially bunching from below.

So essentially, people seem to be, if they're at pace to finish at 4 hours and 1 minute, they try to sort of speed up and just make it to 3:59. So you see a bunch of bunching at the half hour slots. You see actually much less at 6 hours and 30 minutes or something. It seems that few people have actually goals.

Once you run the marathon in 6 hours and 30 minutes, which is probably what I would do, you know, it doesn't really matter whether you're like 6:31 or 6:29. But there's very ambitious people who want to like finish in 4:30, 4 hours, or 3:30 and the like. And there's a bunch of bunching from below there. So you see the same for quarter hour times, a little bit less of that.

And sort of that's consistent with the reference point here being a goal and aspiration. You want to reach 4 minutes. You want to brag to your friends and so on. And it's not so great if you do that and say, I finished in 4 hours and 1 minute as opposed to if you say I finished below 4 hours.

Now, when you look at the effort at the end of the race, what would you expect? So what we have here on the x-axis is people. These are the 40 kilometer pace. These are in 30 second increments.

So the marathon is 42.195 kilometers. So what I'm showing you here is, essentially, the 40 kilometer pace people are ranked or distributed by the 40 kilometer pace, the first 40 kilometers. Now, what you would expect for people-- so there are some people who were at pace to reach 3:55 and some people at pace to reach 4:05 and so on. What is it that you would expect people to do when you look at how fast people run towards the last two kilometers of the race? Yes?

AUDIENCE: If they're really close, they're going [INAUDIBLE] especially hard.

FRANK SCHILBACH: Exactly. And this is what you see. So low means you're running fast. This is minutes per kilometer I think or relative minutes per kilometer. So what you should expect is people who are just below the goal or people who are essentially just above the goal, in fact, these are the people who speed up, OK? And this is exactly what you sort of see is that people who are just below the 4 minute mark or some people who are just above, they speed up to just make it to that goal.

And sort of Allen et al. Have a sort of analysis of this. Essentially, what they find is that everybody gets sort of slower towards the end of the race. But if you're sort of in reach of reaching the goal by reaching the time of 4 hours, you're going to slow down less or speed up a bit to just reach that specific goal, OK?

Let me show you one more thing of sports, which is golf. So how does golf work? In case you don't know, you hit a ball with a club from a tee into a hole.

The way this works is there's usually 4 rounds of 18 holes. There is very convex incentives in the golf tournament. So you get a bunch of money if you win, if you're sort of at the top.

For an average performance, essentially you don't make that much money. I mean, you make good money, but the prize money is really in terms of when you do really well. So now, what is par?

Par is how many strokes, many shots, do you need to-- how many shots a very good golfer should require to complete a given hole. So par is usually 3, 4, or 5 shots. And then eagle is 2 below par.

So if you have a par 4 hole, if you do 2 shots, that's an eagle. If you do 3 shots in that case, that would be a birdie. 4 would be par. Bogey would be 1 above par. And double bogey would be 2 above par, OK?

So knowing all that, so what matters for golf at the end of a tournament is how many shots do you make in total. So how can we now look at reference-dependent preferences here in this setting? Yes.

AUDIENCE: The reference is the par [INAUDIBLE].

FRANK SCHILBACH: Yes. The reference is the par. Now, suppose you are putting, which is at the end, you know, on the green. What are you going to do? What kinds of behaviors do we expect? Yes.

AUDIENCE: Well, it depends. So if you're under par, then you might try-- like, you're shooting for birdie, or you're shooting for par and it's a long putt, you might try to make sure that you get it to the hole. Whereas, if you are already over par or double over par, you might try to play a little safer, make sure you're not way over.

FRANK SCHILBACH: Right. So some of this is about risk preferences, how risky your shots are. Another way to think about this is kind of how much effort do you put in your shot. In some sense, to the extent that you can sort of allocate attention or really focus an effort, maybe that's sort of limited over the course of 18 holes and 4 rounds of each of those. You might sort of try particularly hard to do well on shots that make you reach par compared to shots that might get you a birdie or even better.

And so this is exactly as you say. The fairly obvious reference point for each hole in golf is reach par. Importantly, it doesn't matter whether you have birdie, par, and bogie, versus par, par, par. Essentially, that gives you exactly the same amount of shots overall. But now what Pope and Schweitzer ask is the question, are putters more likely to make their par than their birdie points, right?

So essentially, depending on are you at possibility of losing or at gaining, essentially if you're worried about losing par, are you going to behave differently compared to when you can make a birdie, which is in the gain domain potentially? The same you could say about bogies, where you're already in the loss domain because you're already doing terribly. And you're trying to avoid a double bogey.

So now, what they find, essentially, is the par putts are much more likely to be made. There's 2 or 3 percentage points more likely to be made compared to equivalent birdie putts. The authors rule out a bunch of different explanation.

It doesn't have to do with the heterogeneity of player ability. They even have sort of like GPS information of exactly where the ball is compared to the hole. And they do all sorts of comparison of how hard the shot is. They don't think it has to do with learning from earlier putts.

And it seems to also not have to do with hole specific preferences. Some holes are really hard, and some holes are really simple and easy and so on. So it doesn't seem to do with any of that.

So again, that's sort of another instance of reference-dependent that seems to be in quite a few settings. Let me sort of skip the *Deal or No Deal* TV show, which we can do briefly in recitation, and talk a little bit about prices and firms. So one fact that we see in the world is that demand often responds more strongly to price increases than to price decreases of frequently purchased items.

And we already discussed this last time. That's to say, so usually people have a reference point in terms of either the price they pay or the expenditures on certain items. So now, as something becomes more expensive, what they tend to do is essentially reduce how much the, for example, gasoline or the like.

They tend to then sort of just reduce their expenditures because they have a budget for, say, gasoline or certain items. And so what they tend to do is then the reference point is either the past price or the past expenditures. And people tend to sort of be loss averse then over their expenditures over the specific domain.

Now, that then leads to-- so if a firm knows this, so essentially if you know that essentially people react a lot to price increases compared to price decreases, that leads to sticky prices, essentially.

So raising your price above a past price is very costly because you lose a lot of customers from doing that. So now, lowering your price below the past price won't actually do very much. Essentially, you're not going to generate a lot more extra demand.

Plus, raising the price in the future is costly. You know, essentially, once you lower the price, it's hard to get up any more. So for these frequently purchased items, you see a lot of price stickiness and price equalization across markets, across time and products.

Now, that's sort of one thing about prices in the world that you would see. But more generally, I want to sort of ask the question in the last few minutes about, if you were a company, suppose you did an internship somewhere in the summer. You took behavioral economics.

Hopefully, you learned something. But what can we learn about the firm policies and so on now that you know about loss aversion? What would you tell them they should do? Yes.

AUDIENCE: You could start with having a really high price and then lowering them. Because people will feel like, oh, I'm getting [INAUDIBLE] deal.

FRANK SCHILBACH: Right. So that was what previously was mentioned is I say, you could sort of, in particular when you introduce a price, new product and so on, you might want to start at a high price and then sort of lowering them. And people really like having deals, and they feel good about it.

Notice that that doesn't work so well for products that you already have and so on. Because then essentially, once you start with a high price, people get really upset. And you will lose the customers.

But once you introduce a new product, be it like an iPhone or be it like some whatever, new computer or whatever, it makes a lot of sense to start with a really high price. That sort of sets the reference point. And then people sort of feel like they get good deals overall. What else could you do? Yes.

AUDIENCE: You could offer [INAUDIBLE] price. You could offer a temporary discount. That was you keep your reference point. [INAUDIBLE] offer discounts when you want to lower the price temporarily [INAUDIBLE].

FRANK SCHILBACH: Exactly. That's what a lot of companies tend to do. They tend to do, essentially, these special occasions with Black Friday and the like. Exactly as you say, it's temporary.

It's not a thing that prices are permanently lower. It's just, right now, you get this great deal. And then things go back to normal. And somehow you have to hope that people don't sort of adjust their reference point towards the temporarily lowered price. What else? Yeah.

AUDIENCE: Kind of down that line, you have free trials. So companies sends you--

FRANK SCHILBACH: Yes.

AUDIENCE: --for [INAUDIBLE] and then take it away, people will feel more compelled to get it back because it's loss aversion. And that's what [? creates ?] [INAUDIBLE] people value it at higher price than otherwise.

FRANK SCHILBACH: Yes.

AUDIENCE: So [INAUDIBLE].

FRANK SCHILBACH: Yes. So if you shop online, you might have wondered. Lots of companies have this thing on like, oh, you can order whatever you want. Essentially, it's free returns.

And you kind of wonder, that seems like a bad deal from the company's perspective. Because people buy a lot of stuff and send it back. The hope is exactly as you say. It might be just in part people like to experiment. And they like some stuff and not others. And that's worth doing it.

But the hope, in particular, is to say, well, I want you to try it out for a while. You get used to it. Then the endowment effect kicks in.

You value it more. It essentially becomes yours. And then essentially you become loss averse towards that.

By the way, I should have mentioned this is really a fascinating book by Cialdini who was talking about the psychology of persuasion. He spend a lot of time with salespeople, in particular sort of car salespeople and so on, trying to learn what are they actually doing in markets. And he has these amazing stories of salespeople, what's all sorts of tricks they use.

It's psychologically extremely rich and interesting in terms of just trying to understand what people do. And that ranges from things, once you purchase a car, they let you test drive in the car. And you sit in it. And it feels like yours.

Or when you try to buy a house, then people would say, oh, you know, this will be your living room. And this is where your baby is going to sleep. And there's lots of sort of ways in which people make sort of something feel yours and really try to sort of get the endowment effect to kick in.

If you were to work in an insurance firm, what would you do, somebody who offers insurance in one way or the other or products that offer insurance in some ways? Yes.

AUDIENCE: We talked about this a little bit in a previous class. But this is why, I think, companies will sell things like Apple Care or operative warranties. Because they know they'll make money off of it because people tend to over-insure.

FRANK SCHILBACH: Exactly. There's lots of different products where there's extended warranties and all sorts of things, like Apple care, et cetera, where people are very risk averse, what it looks like, presumably loss averse where, in fact, actually the claim rate tends to be very low. So you can make a lot of money with this by saying, yes, I'm going to exchange it and this and that.

Because, essentially, it doesn't happen that often at the end of the day even if there's moral hazard or other issues of people not treating their stuff that well once they have insurance. What about wage setting, like when you set your employees' wages? Yeah.

AUDIENCE: Could that be linked to mass unemployment in recessions because you know that, if you lower the wage, then morale will go down a lot? And you can actually decide just to kick them out?

FRANK SCHILBACH: Right. Exactly. So there is a large literature on wage stickiness, essentially exactly as you say, where people are extremely reluctant to lower wages. Companies are very reluctant to lower wages. Because, essentially, workers are really unhappy. And these are often nominal wages or real wages. It doesn't really matter that much, but usually it's nominal wages.

People really, really dislike nominal wage reductions. And so, now, in some times when companies would actually need to lower wages and sort of to be able to keep workers not to make losses, companies might rather sort of fire some workers rather than sort of lowering the wages for everybody. Because, essentially, the remaining workers, once you lower wages for everybody, everybody would be unhappy. If you just fire one worker, everybody else will be less unhappy than about their wage reductions.

Similarly, firms are sort of reluctant to hire people at lower wages, if there's other people who make higher wages, because people really dislike weight dispersion. So essentially, overall, you want to avoid wage cuts as much as possible. And that leads to essentially then sort of macroeconomic inefficiencies.

And people have argued, in particular, it leads to unemployment because, essentially, wages are not going down as much as they should in recessions. And that's bad for firms. And, therefore, they hire fewer workers or retain fewer workers overall.

I think I mentioned, we mentioned, all of those kinds of things. So now, that's sort of what firms are doing. Now, another thing you might think about is what are you going to actually do in your real lives.

I think there's many different things that you can actually think about is the framing of situations, for example, can make a big difference. If you present something to your friends, different options, whether you present that as gains or losses makes a big difference potentially. Managing people's expectations is really important.

If there's some big goal that they could reach or some lower goal they could reach, if you sort of oversell the high chance of reaching some big goal, they might reach the other goal that's actually pretty good, might feel really disappointed about that, be it in job search or the like. So managing people's expectations, including your own expectations, seems really important.

There's something about aggregating losses and gains, which essentially is to say, since people seem to be risk averse over gains-- so since value function is concave over gains and convex over losses, what you should do is potentially be really careful about when you give people a positive or negative feedback or bonuses and so on. You might want to sort of be careful whether you aggregate the losses or-- so aggregating losses makes sense because essentially it's convex in the loss domain, as opposed to you want to give small increments of gains overall.

Now, one thing that I do want to mention is you want to be kind of very careful with loss-framed incentives. There's a company who was trying to do this. These are car manufacturers who were trying to give essentially their car dealers incentives, sort of targets for their sales of their cars.

What essentially happened in the end of the day is there was a bunch of multitasking. The company or the car salespeople were essentially selling certain cars, but then not others and were essentially multitasking and then sort of reverting, sort of reallocating efforts to one thing versus the other, which then seemed like a really good idea. There was recently a valuation that sort of showed that that was actually a pretty bad idea. And the company would have lost a lot of money overall if this had been scaled.

We're going to have this, the *Deal or No Deal* and this specific paper in recitation to tell you in more detail because I want to move towards social preferences next time. So as I said, next time we talk about social preferences. Bring your laptop. And I'll send you further instructions. Thank you.