219B – Problem Set 2 – Due in class on Feb. 20, 2013
Reference Dependence

Question #1

In this Question and the next we consider the impact of reference dependence on labor supply. Consider Colin, a reference-dependent cab driver deciding how many hours h ($h \geq 0$) per day he intends to work For simplicity, Colin lives only a single day, with hourly wage w. Colin's daily earnings therefore are $w * h$. Driving more is increasingly costly, so the cost of effort is $\theta h^2/2$. Colin's utility function is reference-dependent with respect to the daily earnings, with daily reference point $T > 0$. Colin's utility function therefore is

$$U(h; T, \alpha, \theta, w) = \begin{cases} wh - T - \frac{\theta h^2}{2} & \text{if} \quad wh \geq T \\ \lambda(wh - T) - \frac{\theta h^2}{2} & \text{if} \quad wh < T \end{cases}$$

a) Do a qualitative plot of $U(h; T, \lambda, \theta, w)$ as a function of the hours h for $\lambda = 2$. If it helps, assume $w = 20$, $T = 100$, $\theta = 1$. Provide an interpretation for the parameter λ.

b) Do a qualitative plot of $U(h; T, \lambda, \theta, w)$ as a function of the hours h for $\lambda = 1$. If it helps, assume $w = 20$, $T = 100$, $\theta = 1$. This is the utility function of Hank, a cab driver with a standard utility function.

c) In the next two points, we consider the maximization problem of Hank, the standard cab driver, who wants to determine the optimal number of hours worked h_H^*. Maximize the utility function $U(h; T, \lambda, \theta, w)$, keeping in mind $\lambda = 1$ for Hank. (Do not make any other assumption on the other parameters) Plot the resulting solution $h_H^* = h_H^*(w, \theta)$ and explain why this is Hank's labor supply function.

d) Suppose that an econometrician observes repeatedly draws (h_{Ht}, w_{Ht}) from Hank's labor supply and estimates the labor supply function with an OLS regression:

$$h_{Ht} = \alpha + \beta w_{Ht} + \varepsilon_t.$$

What estimates does the econometrician get for α and for β? Provide intuition on the sign and magnitude of the coefficients. Is the model well specified?

e) Now we go back to the case of Colin, with $\lambda = 2$. Maximize the utility function $U(h; T, \lambda, \theta, w)$, keeping in mind $\lambda = 2$ for Colin. This is harder than for Hank, keep in mind corner solutions (Hint: Distinguish the cases $\lambda w - \theta T/w < 0$, $\lambda w - \theta T/w > 0 > w - \theta T/w$, and $w - \theta T/w > 0$).

f) Do a qualitative plot of the resulting solution $h_C^* = h_C^*(w, T, \theta, \lambda)$. Compare Colin's labor supply function with Hank's and comment on the differences.

g) Suppose now that an econometrician observes repeatedly draws (h_{Ct}, w_{Ct}) from Colin's labor supply and estimates the labor supply function with an OLS regression:

$$h_{Ct} = \alpha + \beta w_{Ct} + \varepsilon_t.$$

Is the model well specified? If the econometrician runs the model, what sign of β do you expect to find? Discuss.

h) Now we introduce a third taxi-driver, JJ. JJ has reference-dependent preferences also with respect to hours worked, with reference point H. JJ's utility function is

$$U(h;T,\alpha,\theta,w)=\begin{cases} wh-T-f(h;H) & \text{if} \quad wh\geq T \\ \lambda(wh-T)-f(h;H) & \text{if} \quad wh<T \end{cases}$$

where

$$f(h;H)=\begin{cases} \frac{\theta h^2}{2}-\frac{\theta H^2}{2} & \text{if} \quad h\leq H \\ \lambda\left(\frac{\theta h^2}{2}-\frac{\theta H^2}{2}\right) & \text{if} \quad h>H \end{cases}$$

Solve the maximization problem for JJ. You will need to make assumptions about different cases.

i) Plot for at least for one case the resulting solution $h_J^*=h_C^*(w,T,H,\theta,\lambda)$ as a function of w.

Question #2

a) Consider now the Camerer at al. (1997) paper that is the first paper to estimate the labor supply of cab drivers. Camerer et al. estimate the log-linear specification

$$\log(h_{k,t}) = \alpha + \beta \log(w_{k,t}) + \Gamma X_{k,t} + \varepsilon_{k,t}, \tag{1}$$

where k denotes cab driver k, t denotes day t, and $X_{k,t}$ is a set of controls. Summarize their results in the various samples. What is their conclusion from the finding that $\hat{\beta}$ is negative? Provide intuition. How do you interpret the magnitude of $\hat{\beta}$, given that the equation is in logs?

b) Relate this to the answers you gave in question 1, particularly to questions 1.d and 1.g. Setting aside econometric problems for now, and setting aside the fact that they specify the equation in logs, is their test well-specified? Can they conclude that they reject the standard model ($\lambda = 1$)?

c) In the model in Question 3 the cab drivers live only one day. In reality, of course, they live a lifetime and make repeated labor supply decisions. Does this generate problems with wealth effects for labor supply in this case? Discuss. How do you expect wealth effects to operate in general in labor supply decisions?

d) We now consider a first econometric issue, called the division bias. Camerer et al. (1997) do not directly observe the wage $w_{k,t}$, but rather they observe $\hat{w}_{k,t} = W_{k,t}/h_{k,t}$, where $W_{k,t}$ is the total earnings for the day. Discuss why this problem can induce a spurious finding of $\hat{\beta} < 0$ in the estimation of (1). How do Camerer et al. (1997) address this problem?

e) A second econometric issue has to do with the estimation of supply and demand. The data on hours worked $h_{k,t}$ and wages $w_{k,t}$ does not just reflect draws from the labor supply curve, but also potentially draws from the labor demand curve. Suppose for example that the different draws across days of $h_{k,t}$ and $w_{k,t}$ reflect purely differences in disutility of effort across days (θ shifts), and assume a downward-sloping labor demand function. Discuss why this problem can induce a spurious finding of $\hat{\beta} < 0$ in the estimation of (1). (A qualitative plot of fixed labor supply and varying demand may help here)

f) Do Camerer et al. (1997) deal with this second issue? The best case scenario for them to correctly identify the labor supply is that the variation in $h_{k,t}$ and $w_{k,t}$ is caused by shifters of labor demand or shifters of labor supply? Is this plausible for cab drivers?

g) How does Farber (2004) deal with these two problems? Discuss the estimation strategy.

h) Summarize the findings of Farber (2004). Can he reject the standard model of labor supply? Can he reject the reference-dependent model outlined above?

i) Consider now the Fehr and Goette (2007) paper on bike messengers. Describe briefly the design. How does this paper deal with the two econometric problems outlined above?

j) Summarize the findings of this paper on the number of shifts worked and the effort within a shift. An economist makes the statement "Fehr and Goette (2007) find that bike

messengers work more shifts when paid more. This contradicts the reference dependence story". Do a detailed response to this, in light of the model in Question 1. Discuss the assumptions you need to make about the reference earning T. What would happen if workers had a monthly earning target, rather than a daily one?

k) Describe the findings in Crawford and Meng (2011) in light of points 1.h and 1.i above.

l) Given all these papers, how would you summarize the status of the evidence on whether reference dependence affects labor supply?

Question #3.

This question asks you to consider the so-called disposition effect.

a) Summarize the results in Odean (1998) on the share of realized gains and losses, the measure of the disposition effect.

b) Articulate *as clearly as you can* how prospect theory can (or cannot) explain this phenomenon. You can use the intuition, or try a simple model. What assumptions are you making about: (i) the reference point; (ii) when investors update the utility function (that is, when are gains and losses experienced); (iii) the value function is piece-wise linear or exhibits diminishing returns.

c) Discuss at least one alternative explanation of the disposition effect, and the extent to which the data support it.

d) Barberis and Xiong (2009) cast doubt on whether reference dependence can explain the disposition effect. Summarize their argument and identify the key assumptions in their paper. Can you provide some intuition on their findings? [Hint: Barberis and Xiong point out that the standard prospect-theory-based explanations for the disposition effect neglect the role of the kink at the reference point. Elaborate]

e) In light of your discussion in point (d), consider the findings in Ben-David and Hirshleifer (2012) and especially their Figure 1 on the probability on selling shares as a function of the current price, relative to the purchase price. How consistent are these results with a model of reference-dependence where the reference point is the purchase price of the stock? Explain as clearly as you can.

References

* Barberis, Nicholas and Wei Xiong. "What Drives the Disposition Effect? An Analysis of a Long-Standing Preference-Based Explanation." *Journal of Finance*, Vol. 64, 751-784, April 2009.

* Itzhak Ben-David and David Hirshleifer. "Are Investors Really Reluctant to Realize Their Losses? Trading Responses to Past Returns and the Disposition Effect" *Review of Financial Studies* (2012) 25(8): 2485-2532.

Vincent P. Crawford and Juanjuan Meng, "New York City Cabdrivers' Labor Supply Revisited: Reference-Dependent Preferences with Rational-Expectations Targets for Hours and Income", *American Economic Review* 101 (2011), in press

* Odean, Terry. "Are Investors Reluctant to Realize Their Losses?", *Journal of Finance*, 1998, p.1775-1798. (CVF 21)

* Camerer, Colin, Babcock, Linda, Loewenstein, George, and Thaler, Richard. "Labor supply of New York City Cabdrivers: One day at a time", 1997, *Quarterly Journal Of Economics*, p.407-42. (CVF 20)

* Farber, Hank. "Is Tomorrow Another Day? The Labor Supply of New York City Cab Drivers", *Journal of Political Economy*, 2004.

* Fehr, Ernst and Lorenz Goette. 2007. "Do Workers Work More if Wages are High? Evidence from a Randomized Field Experiment." *American Economic Review*, 97(1).