
Problem Set 2

This problem set will be graded and is due by **5pm on Tuesday, February 12th** in my mailbox in the economics department. You may turn in problem sets early by putting them in my mailbox in the economics department or by dropping them off in lecture. No late problem sets will be accepted. You are welcome to work in groups. If working in a group, everyone in the group must still submit an individual problem set.

1. Calculating Income and Substitution Effects

You are given the following information about a consumer's choices of xylophones (x) and yoohoos (y): the price of a xylophone is \$2, the price of a yoohoo is \$2, the consumer has \$100 to spend and the consumer's utility function is given by

$$U(x, y) = 2x^{\frac{2}{3}} + y^{\frac{2}{3}}. \quad (1)$$

- (a) Derive an expression for the consumer's demand for xylophones and yoohoo in terms of p_x , p_y and I and calculate the consumer's optimal bundle at the current prices and income.
- (b) Now the price of a xylophone drops to \$1. By how much does the demand for xylophones change?
- (c) Under the new prices, what level of income would allow the consumer to buy his old optimal bundle?
- (d) Calculate the change in demand for xylophones due to the income effect and the change in demand for xylophones due to the substitution effect.

2. Rebating a Tax

As a result of its budget crisis, the State of California decides to impose a new tax on gasoline. The tax adds an additional 5 cents to the price of every gallon of gas purchased. As a result of the tax, people decrease both their gas consumption and their consumption of other goods from (g, o) to (g', o') . The City of Davis has decided to help out its residents by offering them a rebate to offset the new gas tax. Three proposals are offered:

- Proposal A will give people a check to raise their income enough to make their old bundle (g, o) just affordable.
 - Proposal B will give people a check to raise their income enough to make their old utility level just affordable.
 - Proposal C will position Davis city council members at all of the gas stations in town and have them directly refund the tax as people buy gas (each time an additional gallon is pumped, a city council member hands the driver a nickel which he can then give directly to the gas station to pay the tax).
- (a) Graph the budgets constraints, indifference curves and optimal bundles under each proposal. Can you rank the three proposals according to which the consumer prefers?
- (b) Can you rank the three proposals in terms of how much they will cost the City of Davis?
- (c) Suppose that the state gives all of the money collected as gas taxes in Davis to the city council. Between the tax revenue and the expenditures on the gas rebate plans, can you say which plans will lead to a city government surplus and which will lead to a deficit? (Note that the amount of taxes collected by the state will be determined by the final after-tax, after-rebate gas consumption of the Davis residents.)
- (d) Given your answers to the previous parts, is it clear which plan should be chosen? How would the choice of plan depend on the weight placed on consumers' happiness and the weight placed on keeping budget deficits low?

3. Meat and Potatoes

In class we discussed bread as one example of a Giffen good. The basic argument was the following. A family with very little income eats mostly bread but buys a little bit of meat each week as a treat. When the price of bread rises, they can no longer afford that little bit of meat. To replace the calories from the meat, the family needs to buy even more bread than they did before. This problem will walk you through the logic of Giffen goods using a similar example, meat and potatoes.

- (a) Assume that a person consumes only potatoes (T for taters) and meat (M) and that her utility increases whenever calories go up (although she may get more utility from a calorie from meat than a calorie from potatoes). Also assume that potatoes are a Giffen good. From this information alone, can you say whether her budget constraint is binding? In other words, will she always spend all of her money or is it possible that her optimal bundle lies below her budget line? Be certain to justify your answer.
- (b) The graph at the end of the problem shows two different budget lines, A and B , and the consumer's optimal bundle on budget line A . Would the consumer's optimal bundle on budget line B be to the right or the left of the dashed vertical line? Would the consumer's optimal bundle on budget line B be above or below the horizontal line? Draw a new optimal bundle on budget line B that is consistent with your answers.
- (c) Can we say for certain whether meat is a substitute ($\frac{dM}{dp_T} > 0$) or a complement ($\frac{dM}{dp_T} < 0$)? Be certain to fully justify your answer. Hint: Your answers to part (b) should help you here.
- (d) Let's think about a third budget line that passes through the optimal bundle you added to the graph in part (b) but that is parallel to the original budget line A . Draw this new budget line on your graph and label it budget line C . Based on this graph and the information in part (a), explain why it must be the case that potatoes are an inferior good.
- (e) Given your answer to (d), can you say for certain whether meat is an inferior or a normal good? Hint: Your answer to part (a) may be helpful here.
- (f) Another type of good that people sometimes think about when looking for Giffen goods is status symbols like designer handbags and expensive watches. The basic argument is that people are more likely to buy goods that are status symbols if they have a higher price tag (making them a more impressive status symbol). Suppose that watches are Giffen goods, so when watches are more expensive, people buy more of them. Based on your earlier answers to the questions about meat and potatoes, are watches a normal or inferior good? Does your answer match up with what you would expect?

- (g) As strange as Giffen goods are, the status symbol example in part (f) seems even stranger. There is something very different about this example compared to the potatoes example (or any other set of preferences we've looked at so far). Can the framework we have developed be modified to more accurately model status symbols? Explain how the components of our utility maximization problem would need to be changed (utility function, budget constraint, tangency conditions, etc.). Hint: Notice that for these status symbol goods, the marginal utility from the good is higher if the price tag is bigger.

