# Chapter 1

## Utility and Indifference Curves

We begin our look at consumer theory by considering utility and associated indifference curves. What do economists mean by utility? Here is what Investopedia says

> "Utility" is an economic term introduced by Daniel Bernoulli referring to the total satisfaction received from consuming a good or service. The economic utility of a good or service is important to understand because it will directly influence the demand, and therefore price, of that good or service.

Early on it was thought that humans experienced a quantifiable and comparable amount of happiness from the consumption of things. We have since found that this assumption is not necessary. It is not necessary for you to be able to attach a number to your happiness experienced by drinking a cold cup of iced tea on a hot day. What economists have found is that we must merely be able to consistently rank bundles of goods. It is this ordering that we call the utility function. One bundle is considered to be better than, worse than, or equivalent to another bundle of goods. So, a person may find that, all things else held constant, they prefer a bundle of (1 Apple and 2 Oranges) to another bundle (2 Apples and 1 Orange). The same person may claim that they are indifferent between (2 Apples and 1 Orange) and (3 Apples and 1/2 Orange). Whenever you are finding it hard to make a decision between two bundles of goods, you must be close to indifference.

Economists have found that a utility function will exist if a consistent preference ordering can be constructed. Indeed, economists claim that the notion of rationality is that if you prefer A to B and B to C, then you must prefer A to C if you are rational. Being rational does not mean that you are not crazy or mentally ill. It merely means that you are consistent in your choices.

It is important to distinguish preferences from what you buy. Some person may say I hate to eat turkey. I will always choose ham or beef. But, in fact if ham and beef prices are $10,000/lb. and turkey's price is $1/lb. they may find they do in fact buy turkey. What these people really mean is that given equal choices of turkey and ham, they would always choose ham. Here we are not involving prices of income or wealth or any other variable concerning their budget. We are only considering how they rank turkey and ham (in given portions).

Utility must be considered net of all disutility of consuming one bundle or another. For example, eating a banana leaves you with a peel that you must throw away. This is a disutility to you. But, eating a handful of nuts leaves you with nothing to throw away. Therefore, we must always consider the net utility imposed by choosing one bundle or another.

Utility or preference ordering is often impossible to know, if you have never tried a particular bundle of goods. In this case, we must assume that people form some sort of expectation of the utility of the untried bundle relative to bundles that are known. All sorts of problems arise in this case, involving trading off one form of expected utility with another form of known utility. These issues form the basis for the economics of information and the subject of risk and uncertainty.

As you peer into the concept of utility, you will begin to find that it is a deeply psychological idea. It is an internal mechanism. For example, you have utility today. But, you also have utility tomorrow and the next day, and so on. Therefore, your total resources now and in the future must be divided between you today and you in the future. This means that you must first have a clear idea of yourself, that you go through time, and that you will feel utility now and in the future. But, is it possible that you today and you tomorrow are, in some sense, different people? How deeply do you feel for that "you of the future" relative to the "you of now"? How about the "you of the past"? Ever get mad and feel regret about what you did in the past and how it affects you now? Who are you mad at?

Let's ignore these complications for a moment. Assume there is one person (if you have a group of people this doesn't really work). The utility function for this one person can be written as

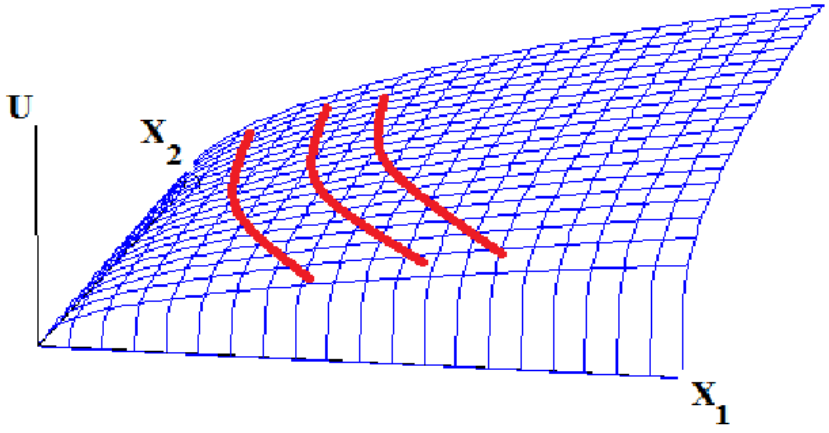
$$U = U(X_1, X_2, X_3, ...., X_N)$$

which is a representation of the orderings of all possible bundles of N goods – some better, some worse, some equivalent.[1]

Let's take an example with N = 2.

$$U = (X_1)^{1/2}(X_2)^{1/4}$$

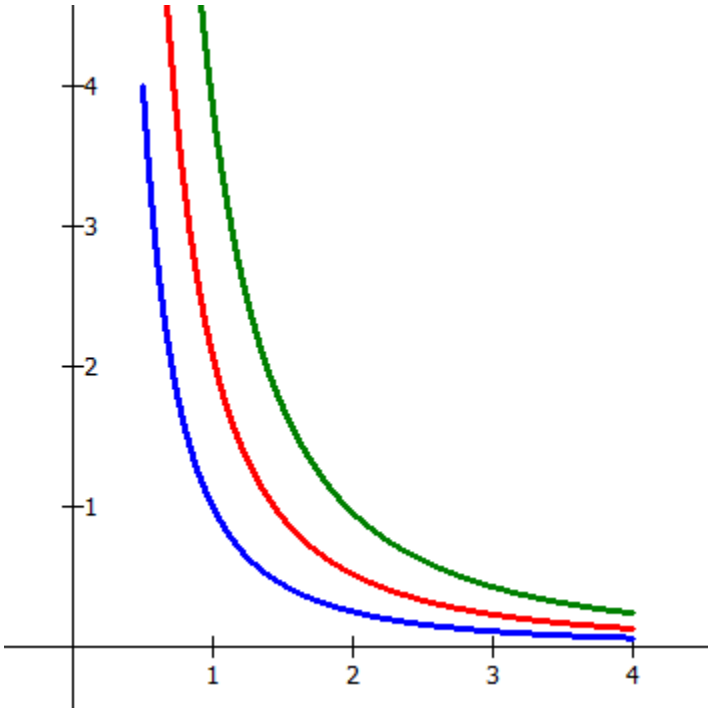
Here is a rough graph of this utility function. The red lines mark off points on the surface having




equal height. That is, points on the surface defined by ($X_1$,$X_2$, U = constant). Think of standing on a hill, then walking around the hill being careful to maintain your height above sea level. Your path around the hill is what is shown in by the three lines, depicting three different heights.

[1] Some economists have emphasized that we do not actually get utility from *owning* goods, but rather from *consuming* them. We use them and combine them to create enjoyable activities. This combining of the goods is called household production. So, we own tennis balls and tennis racquets, but we produce a game of tennis.

Now suppose we project these red lines straight down onto the ($X_1$, $X_2$) plane. We will then get a graph that look like the following. These curves in the ($X_1$,$X_2$) plane are called indifference



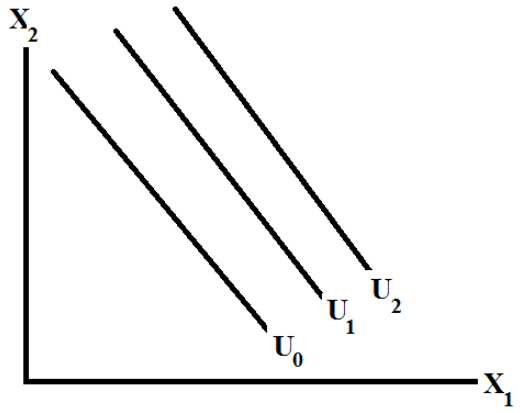

curves. Going from blue to red and then to green we have increasing levels of U. This means that all the points on the green indifference curve are preferred to all points on the blue and red indifference curves. The shape of these difference curves depend on the shape of the utility function in the previous graph. When I drew these curves (using the free Math GV plotting software) I assumed U = 1 for the blue line, U = 1.2 for the red line, and U = 1.4 for the green indifference line. The formula for the indifference curve assuming the utility function above is

$$X_2 = (U_o X_1^{-1/2})^4$$

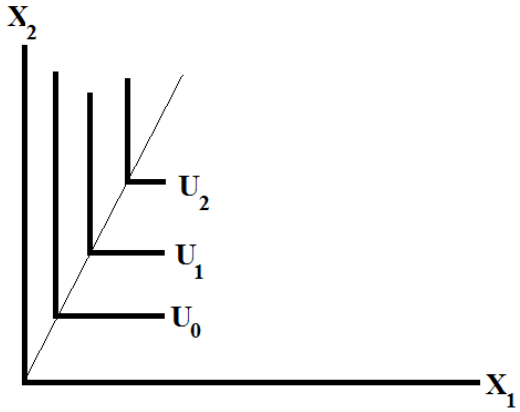
Indifference curves must never touch each other. They cannot intersect. This is because they represent different levels of utility. Indifference curves should not move. This is because we need stable preferences if we are to explain consumer behavior using prices and incomes. If consumer behavior is changing because consumer preferences are changing, we really have no hope of understanding things (since everything is changing). This is why economists have a hard time discussing behavior with other types of social analysts. They do not let peoples' preferences change, which seems overly restrictive to others. But, economists do this because *any* type of behavior can be explained as a change in what people like and dislike.

Here are some very strange looking indifference curves. We will discuss these in class. Note that Example 4 is the standard type of indifference curves. You should become very familiar with this type of graph and be able to draw it and discuss in some depth.

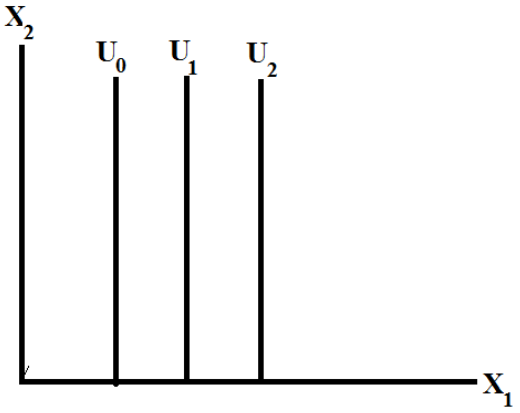
Example 1: Notes:



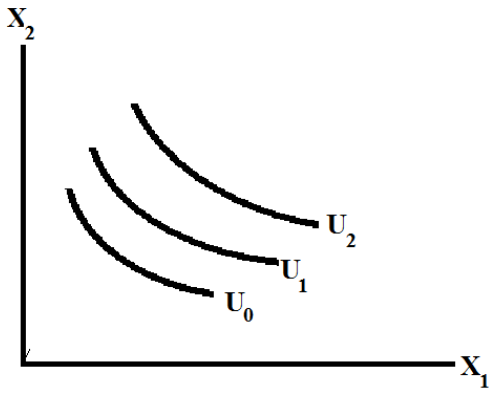

Example 2: Notes:




Example 3: Notes:



Example 4: Notes:




Questions:

1. Can we compare your utility with my utility? How about comparing your utility today with your utility tomorrow? Aren't these questions asking the same thing? Explain.

2. Why can't we say that a person is always happier if his utility increases?

3. Why is it important that prices can change, incomes can change, wealth can change, interest rates can change, etc. but preferences definitely *cannot* change?

4. Bill likes girls with blonde hair, Mike likes girls with black hair, Phil likes girls with NO hair. Why do economists remain unconcerned about what people like? That is, why don't they criticize some people for their tastes? Aren't some tastes good and others bad? Look up the meaning of the Latin phrase " de gustibus non est disputandum ".

5. Many years ago, economists believed that utility was cardinal. Now were feel that utility is ordinal? What's the difference?

6. Why can't indifference curves intersect?

7. For goods $X_1$ and $X_2$ can indifference curves slope upward? Explain.

8. Suppose there are goods and bads. Let $X_1$ be a good and $X_2$ be a bad. Try to draw a standard indifference curve in the ($X_1$, $X_2$) plane.