More on consumer theory: predicting and explaining the choices we make

draft Nov 1, 2011
Choices depend on preferences and and constraints

Wrt constraints, and quoting from a course evaluation

"You seem like a nice guy but you are sooooooooo boring. I would not hang out with you even if you the only person in my budget set."

In my defense, this person understands the difference between his preferences and his constraints.

In previous lectures we discussed the budget constraint and preferences.

Here we discuss preferences in more detail

The relevant chapter is 11.

1 Economists assume individuals have preferences: they can rank bundles of goods such that

Bundle j is preferred to bundle i, or
Bundle i is preferred to bundle j, or
The individual is indifferent between bundles i and j.
And this is true for any pair of bundles i and j

Economists often represent preferences with something called a utility function.[1]

A utility function is simply a mathematical function that assigns a number to each bundle such that is assigns a higher number to bundle k than to bundle v if bundle k is preferred to bundle v, and assign bundles h and t the same number if the individual is indifferent between these to bundles.

The function is chosen such that $u(k) > u(v)$ if bundle k is preferred to bundle v, and $u(t) = u(h)$ if the individual is indifferent between the two bundles. Your $u(.)$ is different from mine $u(.)$.

We call these numbers, *utils* or *utility*. If a bundle m has a higher utility number than bundle w this simply means that bundle m is preferred to bundle w.

[1] Utility is a concept that confuses many paper. Many people want to make more of utlity than is there.

Economists assume your preferences are your preferences- they are what they are. If you like to do activity x with stray dogs, and you would give up everything else to do more of activity x, those are your preferences, which we economists take as given. (**However**, economists might want to influence (restrain or encourage) your choices if your choices directly influence others in a signficant way, including the stray dogs)

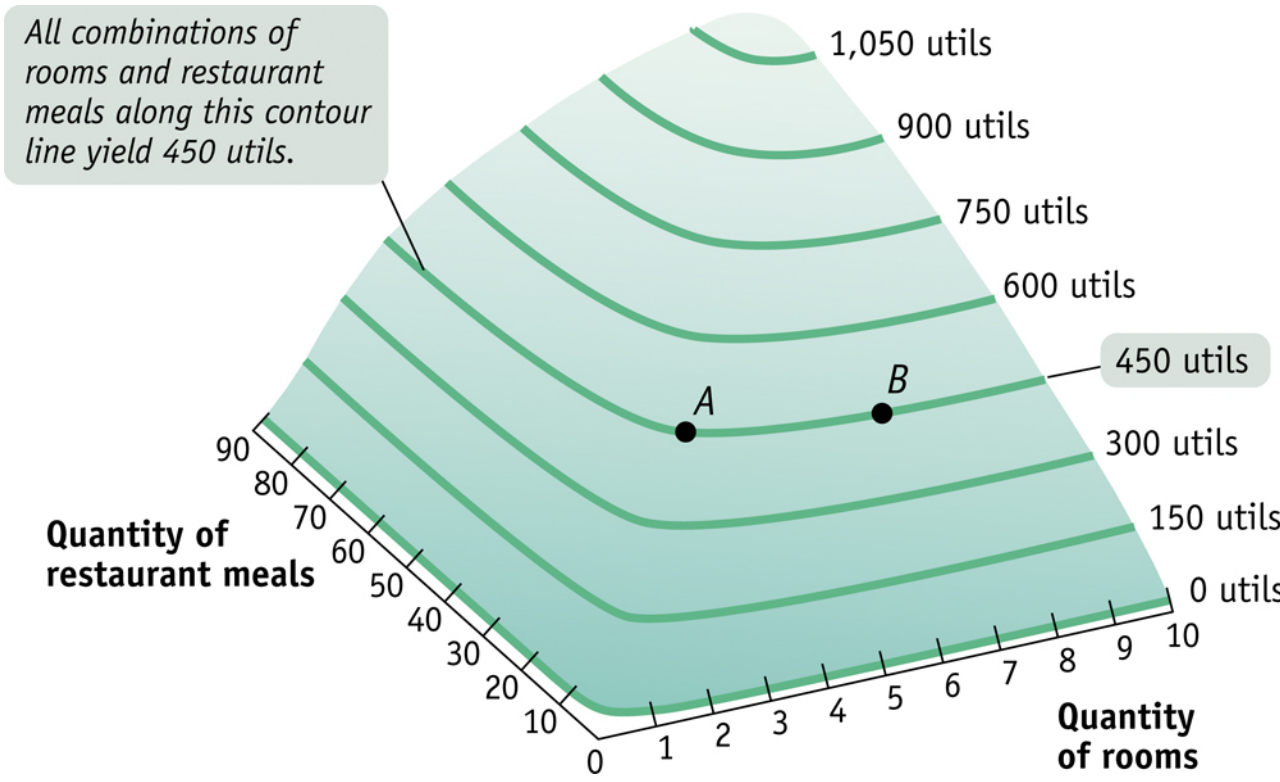
Psychologists, on the other hand, might ask why you have the preferences you have.[2]

[2] Actually, many of them would ask whether people have preferences in the economic sense of the word.

1.1 KW, and I as well, will assume there are only two goods in play

KW assumes the two commodities are restaurant meals and rooms.

they assume $u = (r, m)$. KW choose a matematical function of r and m that would produce a graph that looks like this one.



For my example, my two goods will be aquarium fish and dog biscuits . I have a big aquarium that will hold many fish. My dog, Sofie, likes dog biscuits. My trust fund provides me with a small amount of money each month that I can only spend on fish or dog biscuits, Sofie has no money.

All of our other needs are fufilled by care packages sent by relatives, so none of my money is spent on fish or biscuits.

Sofie always prefers more dog biscuits to less dog biscuits, and I care about Sofie

I always want more fish in the aquiarium.

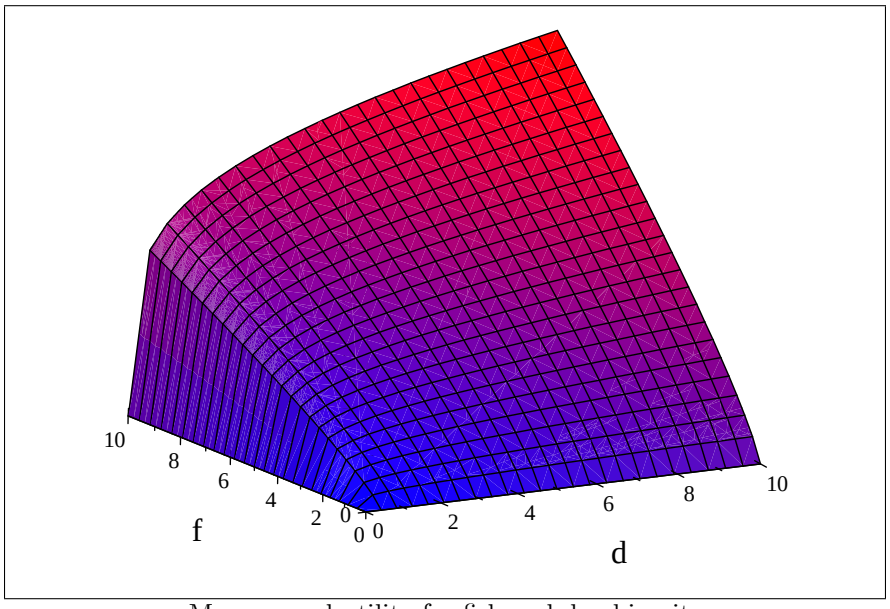
Sofie swimming in my large aquarium

1.1.1 I need to assume a mathetmatical form for my utility function

1.1.2 I choose $u = f^{.8}d^{.2}$. I made fish more important than dog biscuits.

A digression about graphs and mathematical functions. A graph is a visual image of a specific mathematica function. That is, if know the mathematical function I have sufficient information to graph it, and if one has the graph one can work backwards and figure out what mathematical function would produce that graph. As you advance to higher math courses or higher economics courses, the mathematical function of interest will be specified. It will then possibly be graphed so the student can visualize the function. Mostly in Econ 2010 and in the book, the graph is shown without making it explicit the function that generated that graph. Remember that underlying the graph, there is a mathematical function.

I have assumed that, at equal quantities, I prefer fish to dog biscuits.



My assumed utility for fish and dog biscuits

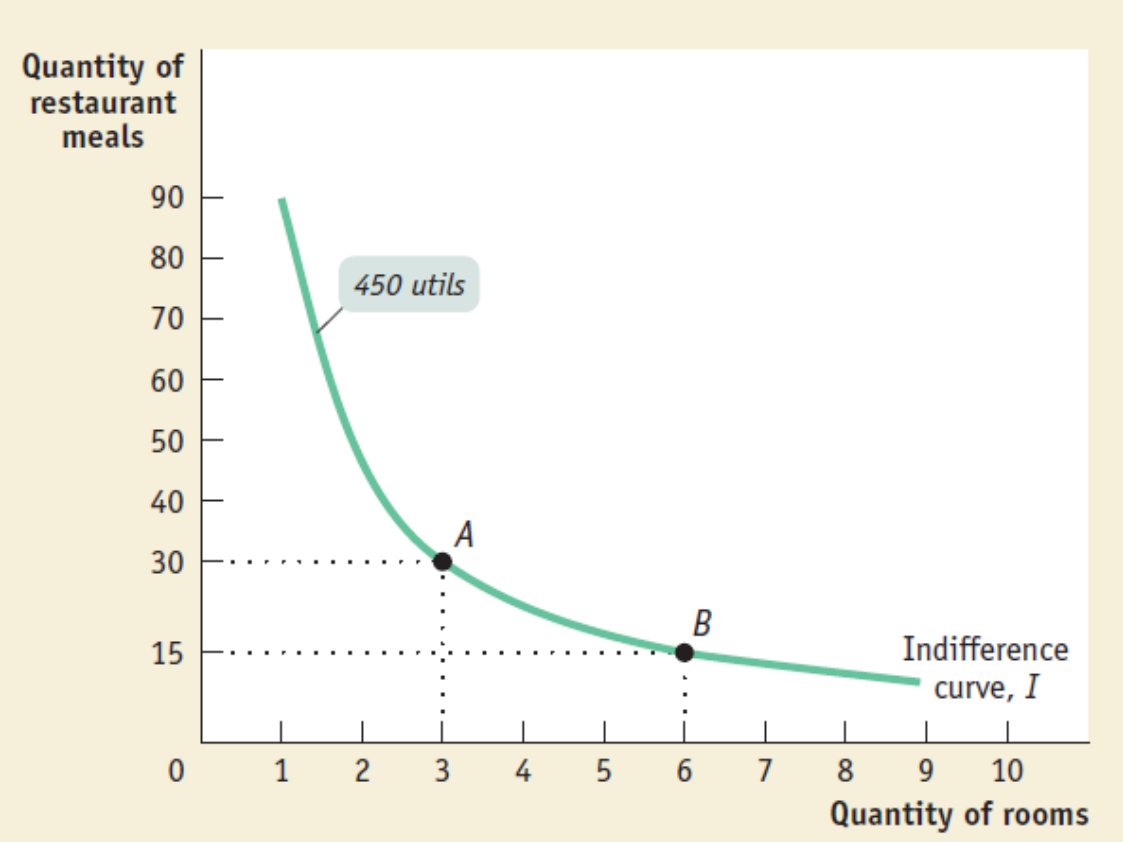
uitlity is on the vertical axis

Imagine all the bundles between which I am indifferent. How would you indentify such bundles? A SWORD?

2 Indifference curves identify all those bundles that achieve the exact same utility.

(Said another way, not using the concept of utility: An indifference curve represents all of the bundles between which you are indifferent)

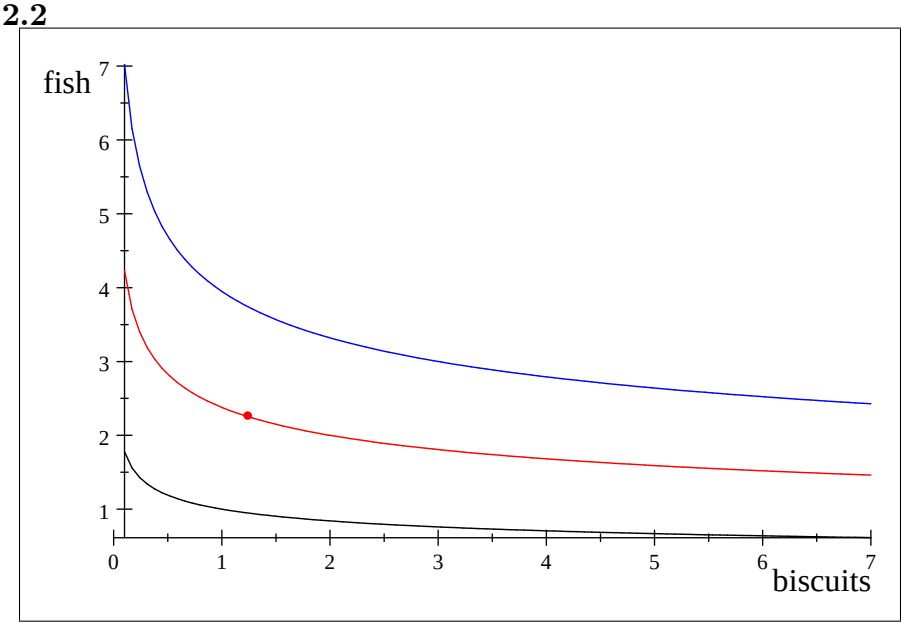
The graph in KW is



relate this to utility function for r and m

2.1 The indifference curves that correspond to my utility function for fish and biscuits

2.2

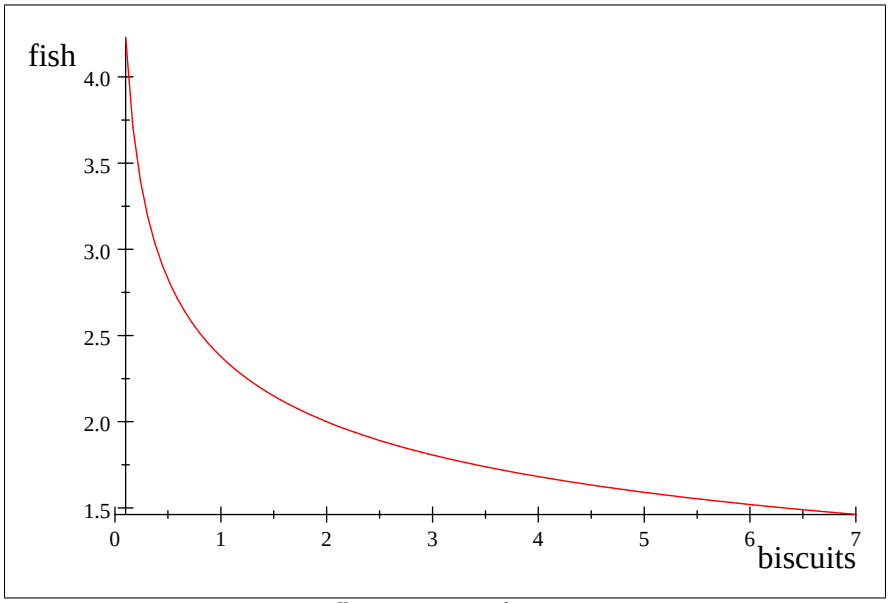


Indiff. curvs : Blk $u = 1$, Red $u = 2$, Blu $u = 3$

For example I am indiffent between 1.25 biscuits with 2.25 fish, and 5 biscuits with 1.59 fish: each of these bundles generates 2 utils.

Notice how the indifference curves become flatter when there are relatively more biscuits than fish in the bundle (steeper as there are relatively more fish in the bundle). It does not have to be this way, but often is this way.

Now let's look at my utility indifference curve for $u = 2$ in more detail



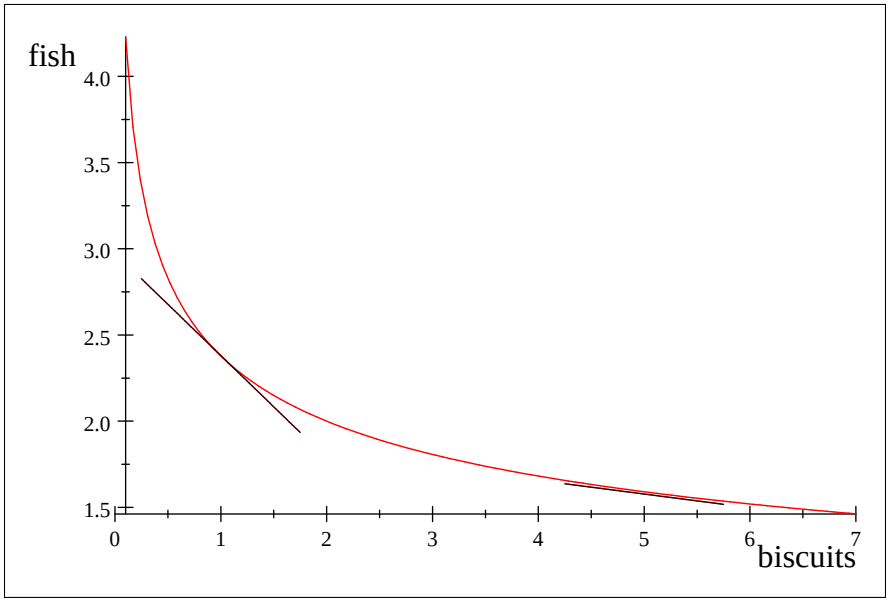
Indifference curve for $u = 2$

Which indicates, as noted above, that I am indifferent between 1.25 biscuits with 2.25 fish, and 5 biscuits with 1.59 fish.

Said another way, to increase my biscuit consumption from 1.25 to 5 (an increase of 3.75 biscuits) I would be willing to give up .66 fish $(2.25 - 1.59)$

2.3 Consider the slope of the indifference curve.

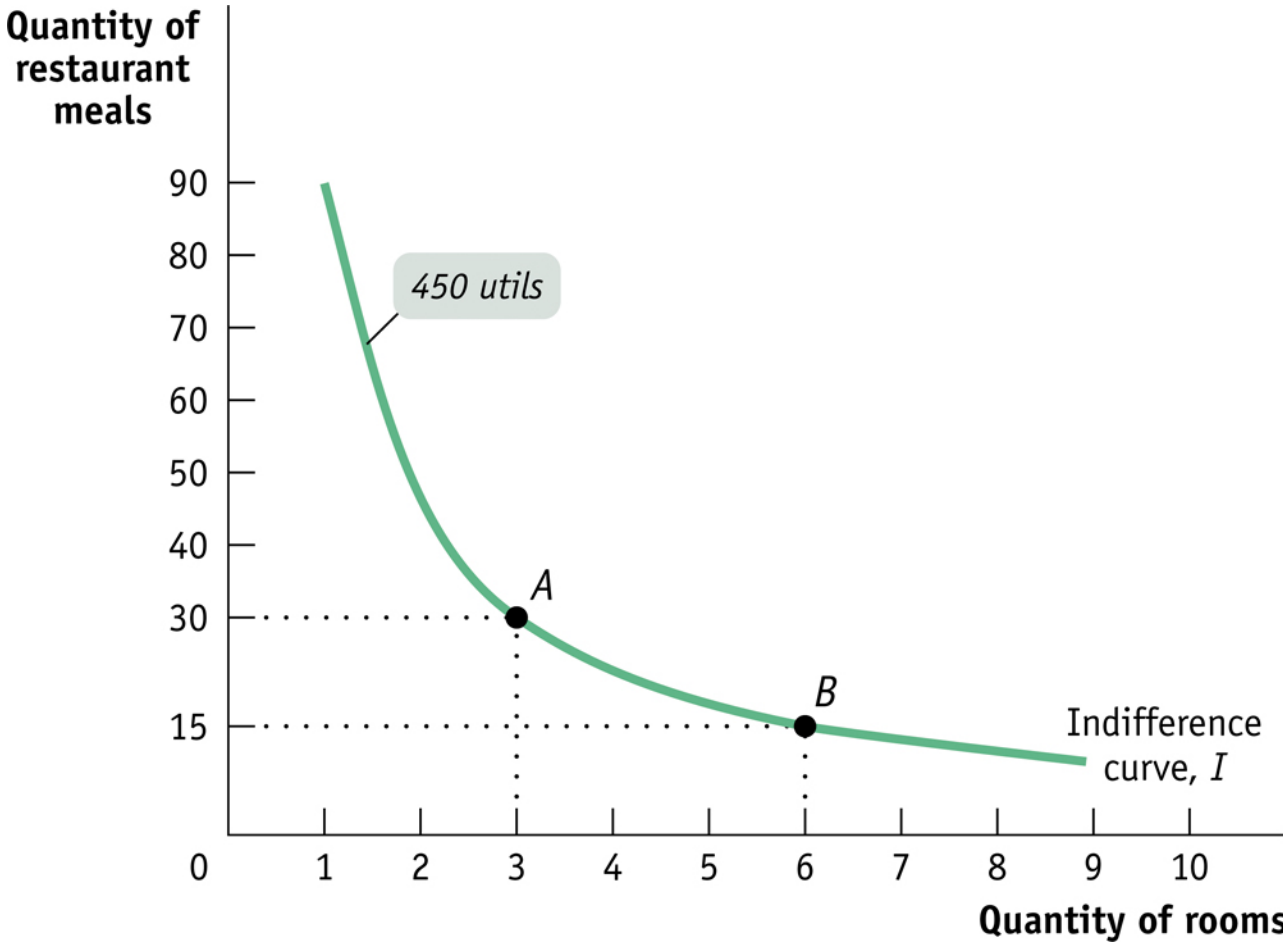
Now I redraw the indifference curve for $u = 2$, adding two tangent lines: one at $b = 1$ and one at $b = 5$. These tangent lines represent the slope of the indifference curve at $b = 1$ and at $b = 5$. Notice that the tangent is steeper (has a more negative slope) at $b = 1$. That is the slope declines in negative value as b increases



Indifference curve for $u = 2$

At dog biscuits $= 1$ the slope is $-.6$, and at dog biscuits equal $= 5$ the slope is $-.08$. Put loosely, when I am consuming 1 biscuit, I would give up .6 fish to get another biscuit, but when I am consuming 5 biscuits I would only give up .08 fish to get another biscuit.

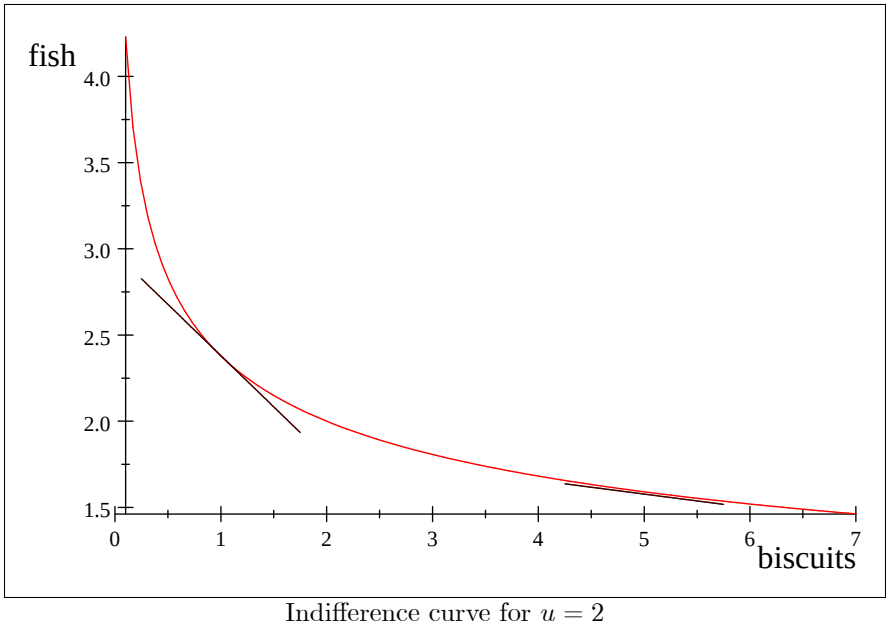
Or in KW


Quantity of restaurant meals
90
80
70
60
50
40
30
15
0
450 utils
A
B
Indifference curve, I
1
2
3
4
5
6
7
8
9
10
Quantity of rooms

2.4 *wtp* (willingness to pay) and *MRS* (marginal rate of substitution

The negative of the slope of the indifference curve, at a specific amount of dog biscuits, is, approximately, how many fish I am willing to give up to get one more dog biscuit

Said another way, it is my willing-to-pay, wtp, for an additional biscuit in terms of forgone fish. Looking back at my indifference curve for $u = 2$, if I am currently consuming 1 dog biscuit I am willing to pay approximately .6 fish (change my fish consumption by $-.6$) to get one more biscuit. Alternatively, if I am currently consuming 5 biscuits I am only wtp .08 fish to get on more biscuit.



Indifference curve for $u = 2$

As the relative amount of biscuits in my bundle increases, my wtp to get more biscuits, in terms of fewer fish, declines. This reflects diminishing marginal utility in the consumption of both biscuits and fish.

If the marginal utility of both goods were constants, independent of the amount of the good consumed, the indifference curve would be a straight line (have a constant negative slope).

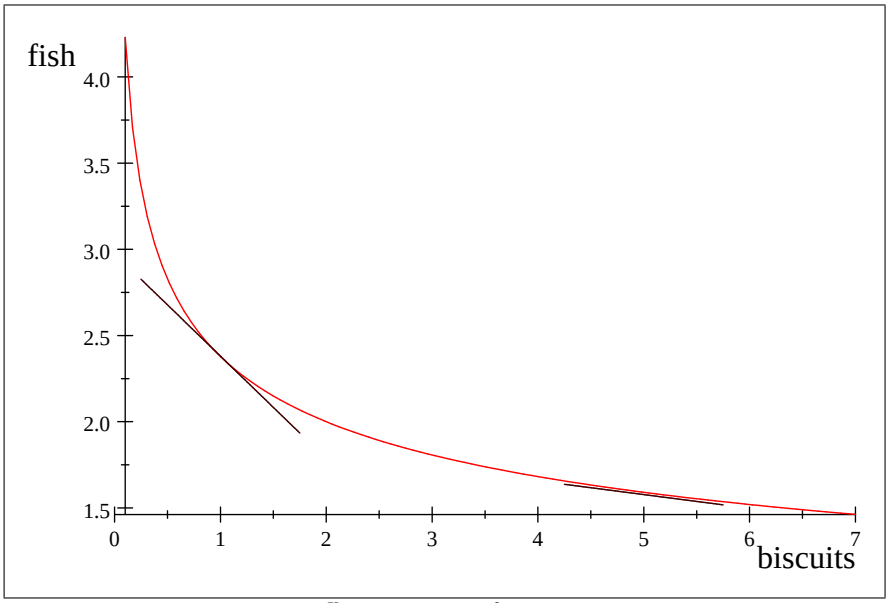
2.4.1 What is my wtp for additional fish in terms of forgone biscuits?

If my wtp for an additional biscuit is .5 fish, then my wtp for an additional fish is $\frac{1}{.5} = 2$ biscuits, as it must. (one is the inverse of the other.)

Another name for wtp for an additional biscuits is the *marginal rate of substitution of biscuits for fish*, $MRS_{bf} = -\frac{\triangle\ fish}{\triangle\ biscuits}\,|_{holding\ utility\ constant}$

Another name for wtp for an additional fish is the *marginal rate of substitution of fish for biscuits*, $MRS_{fb} = -\frac{\triangle\ biscuits}{\triangle\ fish}\,|_{holding\ utility\ constant}$

$MRS_{bf} = -\frac{\triangle\ fish}{\triangle\ biscuits}\,|_{holding\ utility\ constant}$ is the negative of the slope of the indifference curves. Note that indifference curves are typically negatively sloped.



Indifference curve for $u = 2$

We call it the marginal rate of substitution because it reflects the rate at which the individual is willing to substitute one good for another.

Another way to think of MRS_{bf}, the way KW present it, is $MRS_{bf} = \frac{\text{change in utility from having one more biscuit}}{\text{change in utility from having one more fish}}$

> The **marginal rate of substitution**, or ***MRS***, of good *R* in place of good *M* is equal to MU_R/MU_M, the ratio of the marginal utility of *R* to the marginal utility of *M*.

For example, if, at my current consumption levels for fish and biscuits, I would get 1 more util from an additiona fish and .5 utils from an additional biscuit the $MRS_{bf} = \frac{\text{change in utility from having one more biscuit}}{\text{change in utility from having one more fish}} = \frac{.5}{1} = .5$

so $MRS_{bf} = -\frac{\triangle\ fish}{\triangle\ biscuits}\,|_{holding\ utility\ constant} = \frac{\text{change in utility from having one more biscuit}}{\text{change in utility from having one more fish}}$

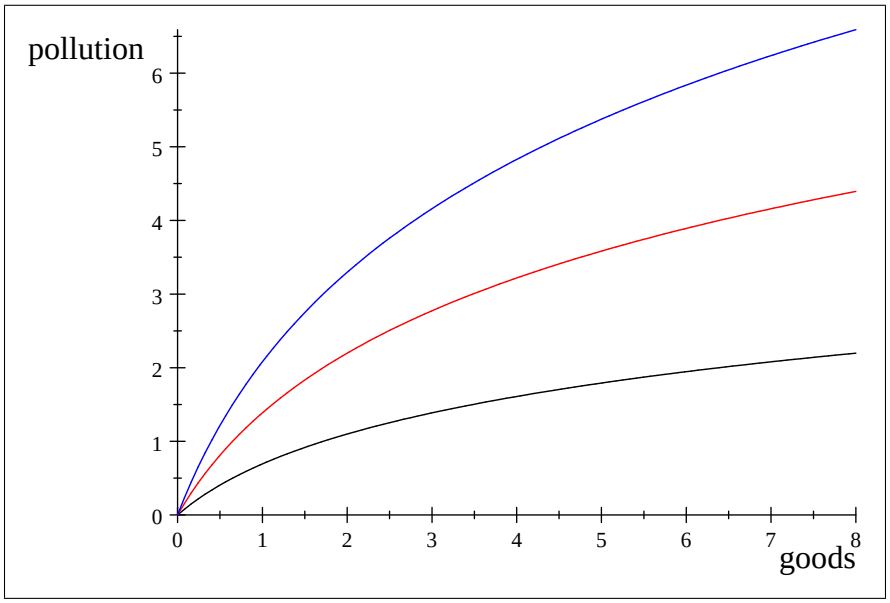
While there are two ways of describing the marginal rate of substitution, I find my way more intuitive. And, my way does not require the concept of a marginal utility.

3 An aside: consider a world of two commodities: *goods* and *pollution*, where goods are good and pollution is a bad.

Draw a representative individiual's indifference curves with goods on the horizontal axis and pollution on the vertical axis, assume everyone has the same preferences.

T.A.s are making up problems where one commoditiy is a good and one is a bad.

The following are three **indifference** curves, each has a positive slope (these are not three different utility functions).



Three indifference curves

In what direction is utility increasing? Remember that uility is constant

along each line because each is an indifference curve. Utility is higher along the black line than along the red line and higher along the red line than along the blue line. Utility increases as one moves to the southeast (more good and less pollution).[3]

Try to visualize the whole utility function when one commodity is a good and one is a bad. What if they were both bads?

Think about wtp and MRS when one of the commodities is a good and one is a bad. E.g. what is your wtp for another unit of pollution? and what is your wtp to get rid of a unit of pollution? Are these amount positive or negative, and what determines their magnitude?

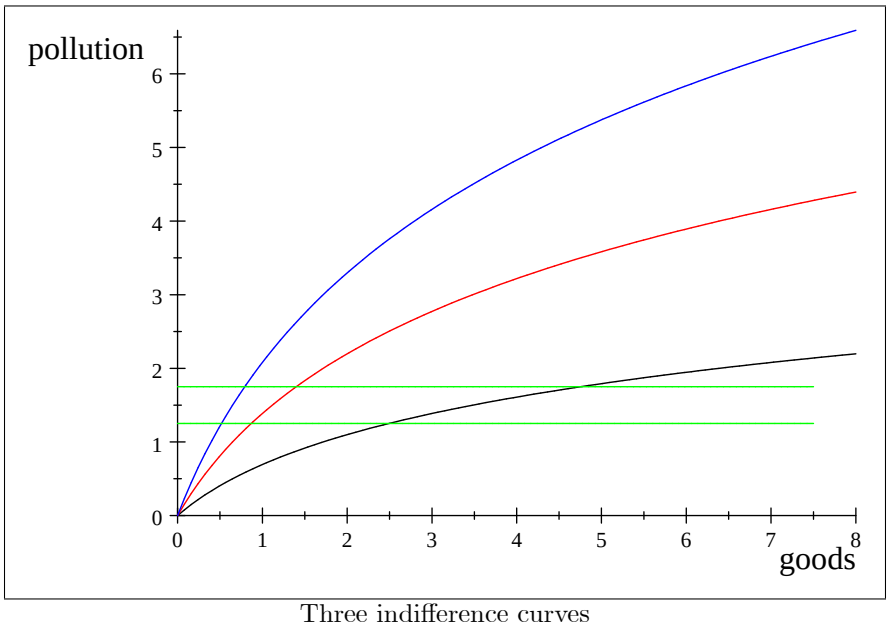
[3] For those mathematically inclined, $p = \ln(1+g)$ for the black line, $p = 2\ln(1=g)$ for the red line, and $p = 3\ln(1+g)$ for the blue line. I chose these functional forms simply because they have the shape and position I was looking for.

Imagine a poor individual, for example one in China on the blue indifference curve, in contrast to a rich Boulderite on the black one

How much would the Chinese guy pay, in terms of fewer goods to decrease pollution from 1.75 to 1.25 units (a decrease of .5units of pollution)?

The top horizontal green line is at 1.75 units of pollution
The bottom horizontal green line is at 1.25 units of pollution

The Chinese guy is currently consuming 1.75 units of pollution and .8 units of goods. He would give up approx. .3 goods (a decrease from .8 to .5 goods) to reduce pollution from 1.75 to 1.25



Three indifference curves

How much would the Boulder guy pay, in terms of fewer goods, to decrease pollution from 1.75 to 1.25 units? Approx 2.25 units (a decrease from approx 4.75 goods to approx. 2.5 goods).[4]

Why such a big difference between what they would pay?

Difference preferences? No, given our assumption that these are the indifference curves for the citizens of both China and Boulder.

[4] $1.25 = \ln(1+g)$, Solution is: 2.490 3
$1.75 = \ln(1+g)$, Solution is: 4.754 6
$1.25 = 3\ln(1+g)$, Solution is: 0.516 90
$1.75 = 3\ln(1+g)$, Solution is: 0.792

The difference in wtp for reduced pollution is much higher in Boulder because real income is much higher (much higher initial utility level).

This result has important environmental implications.

It basically implies that it is more efficient to locate pollution-intensive industries in poor neighorhoods/countries. Because the neighborhood is poor, their wtp for less pollution is low relative to the rich neighborhood. Put simply, poor people relative to rich people, care more about goods than they care about pollution. If it is a choice between feeding the kids by working in a polluting factory, or no job and starving kids, most people would choose the polluting factory, even if would kill them in twenty years. I, on the other hand, would happily have my taxes raised if it substantially reduced global warming.