Theory of the Consumer

1 Consumer Behavior

We need to understand where demand is coming from.

→ need to develop a theory of **individual behavior - based on the simple concept that people choose the best things they can afford.**

→ need "best" - use the concept of consumer preferences

→ need "can afford" - use concept of budget constraints

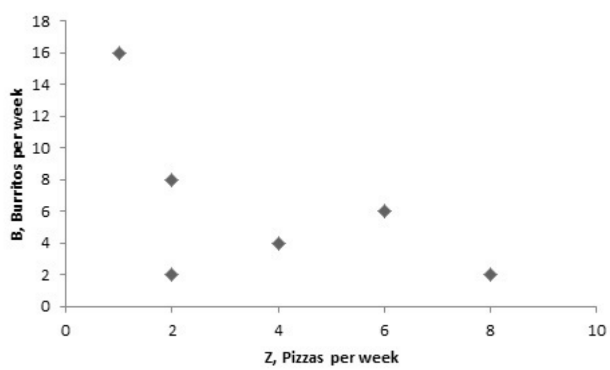
1.1 Consumer Preferences

Consumer preferences tell us how an individual would rank bundles of goods and services if **they were available at no cost.**

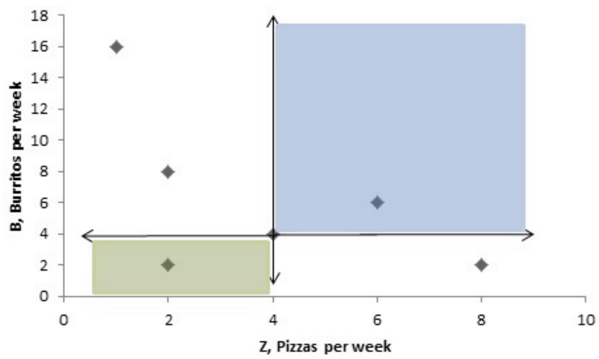
1.1.1 Assumptions Over Consumer Preferences

1. Complete
2. Transitive
3. More is better

1.1.2 Indifference Curves



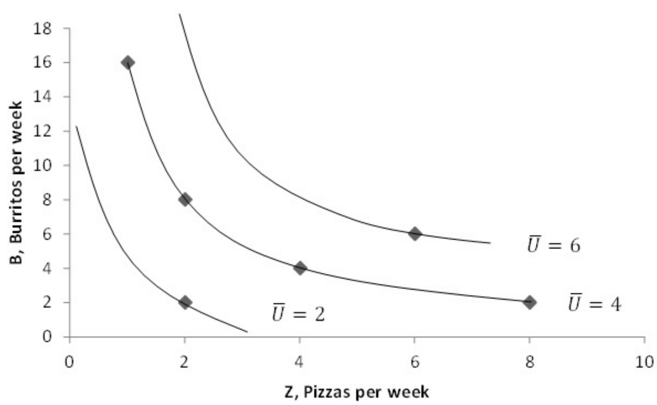
Deriving demand curves



Deriving indifference curves

We use these to graphically describe preferences on a preference map or indifference map.

→ on the indifference curve - the consumer is indifferent (∼) between any point.



Deriving indifference curves and preferences

→ all points to the NE of indifference curve are preferred (≻) to being on the indifference curve

Impossible indifference curves

1. Crossing
2. Upward sloping
3. Thick

It is important to note that the shape of the indifference curve depends on the individual's preferences, which are characterized by the slope of the indifference curve, known as the **marginal rate of substitution.**

Marginal Rate of Substitution (MRS) = absolute value of the slope of the indifference curve

MRS = what an individual is willing to give up of one good to obtain more of another

→ MRS describes how an individual substitutes between the two goods

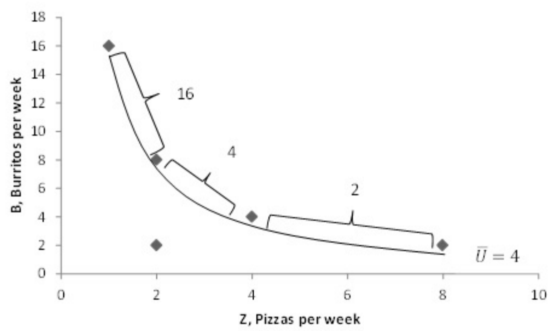
→ MRS = marginal valuation

Of course if $MRS = |\text{slope of indifference curve}|$ how can we calculate it?

$MRS_{Z,B} = \left|\frac{\Delta B}{\Delta Z}\right| \approx \left|\frac{dB}{dZ}\right|$

Also, it is important to realize that $MRS's$ diminish - the more you have of a good, the more you are willing to give up in exchange for the other good.

i.e. as $Z \uparrow \Rightarrow MRS_{Z,B} \downarrow$



Diminishing MRS

Special Cases (previous examples used imperfect substitutes)

1. Perfect Substitutes- e.g. coke & pepsi

MRS=constant

2. Perfect Compliments- e.g. computer & monitor or pie & ice cream

MRS=zero

→Compare to imperfect substitutes

3 In-class Problems:

1. Marie is a philanthropist

2. Brian considers tickets to the New England Patriots and the Boston Red Sox to be perfect substitutes

3. David views two candy bars and one piece of cake as perfect substitutes.

1.1.3 Utility

We use the concept of utility to represent the rather fuzzy concept of preferences, using our 3 assumptions over preferences.

Be careful - we do not use measures of cardinal utility, we only use ordinal utility.

Geometrically, a utility function is just a way to label indifference curves - it just assigns numbers to different indifference curves in such a way that higher indifference curves get assigned larger numbers.

1.1.4 Preferences and Associated Utility Functions

2 goods Z and B:

$$U = f(Z, B) \to U(Z, B)$$

For any $U(Z, B)$ - get indifference curves by plotting all points of Z and B such that $U(Z, B) =$ a constant.

Mathematically, the set of all (Z, B) such that $U(Z, B)$=constant is called a **level set** - so indifference curves are **level curves.**

e.g. Square root utility: U(A,B)=$\sqrt{ZB}$.

1.1.5 Marginal Utility

In our theory of choice we need to know how the **level of satisfaction will change in response to a change in consumption**

i.e. how does $U(Z, B)$ change for a small change in Z (or B)?

$\to \frac{\Delta U(Z,\overline{B})}{\Delta Z} \approx \frac{\partial U(Z,\overline{B})}{\partial Z} = MU_Z$

$\to MU_Z$ measures the rate of change in utility associated with a small change in the amount of Z, all else constant.

Examples:

Cobb-Douglas Utility: $U(A, B) = A^c B^d$

$MU_A = cA^{c-1}B^d$

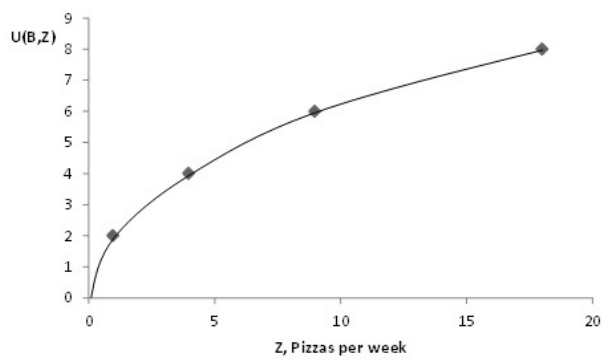
$MU_B = dA^c B^{d-1}$

Perfect substitutes utility: $U(A, B) = \alpha A + \beta B$

$MU_A = \alpha$

$MU_B = \beta$

example: Assume $U(B, Z) = \sqrt{ZB}$ and $B = 4$ burritos.



Diminishing MU$_Z$

Note that with marginal utilities, as you get more of a good, the increment to total utility tends to decline. This leads to the well known:

Principle of Diminishing Marginal Utility

After some point, as consumption of a good increases, the marginal utility of that good will fall.

Examples:$(B, Z) = \sqrt{BZ} = B^{1/2}Z^{1/2}$ and $B = 4$

Z	$U(B,Z)$	MU_Z
0	0	
2	2.8	$= 2.8 - 0 = 2.8$
4	4	$= 4 - 2.8 = 1.2$
6	4.89	$= 4.89 - 4 = .89$
8	5.65	$= 5.65 - 4.89 = .76$
10	6.32	$= 6.32 - 5.65 = .67$

or

$MU_Z = \frac{1}{2}B^{1/2}Z^{-1/2}$

2. Perfect substitutes utility: $U(Z, B) = \alpha Z + \beta B$

$MU_Z = \alpha$

$MU_B = \beta$

Let $B = 0, \alpha = 2, \beta = 4$

Z	$U(B,Z)$	MU_Z
0	0	
2	4	=4-2=4
4	8	=8-4=4
6	12	=12-8=4
8	16	=16-12=4
10	20	=20-16=4

So it should be clear that MU depends on the utility function we use to describe the preference ordering.

But be careful, because by itself MU has no behavioral content.

→ consumer behavior only reveals information about ranking of bundles, not magnitudes.

→But, the MRS has behavioral content!!!

Remember:

MRS = slope of indifference curve at a given bundle of goods

= rate at which a consumer is just willing to substitute a small amount of one good for another.

The point is that the MRS basically tells us how changes in consumption move a person along the indifference curve.

Optional: Calculus derivation of MRS

To derive the MRS, one can find the slope of the tangent lines along the utility funtion.

$U(Z,B)$

$\frac{\partial U(Z,B)}{\partial Z}dZ + \frac{\partial U(Z,B)}{\partial B}dB = 0$

$MU_Z dZ + MU_B dB = 0$

$\frac{dB}{dZ} = -\frac{MU_Z}{MU_B} = MRS_{Z,B}$

And the beauty is that the MRS can be observed!

1.2 The Budget Constraint

Now we are interested in what a consumer can afford in order to understand the second half of our original question.

For our simple two good, Z and B example, let their prices be p_Z and p_B, and let the consumer's income be given by I.

So as people cannot spend more than their income we can derive their budget set::

$p_Z Z + p_B B \leq I$

and if we want to graphically describe this in Z, B space, notice it is linear and then rearrange into $y = mx + b$ form to find the equation of the budget line:

$B = \frac{I}{p_B} - \frac{p_Z}{p_B}Z$

→everything to the left of the budget line is affordable

→everything to the right of the budget line in unaffordable

e.g.

$p_Z = \$3, p_B = \$3, I = \$24$,then,

$B = \frac{24}{3} - \frac{3}{3}Z = 8 - Z$

Note - the slope of the budget line measures the market rate of substitution between the two goods (i.e. the market's marginal valuation):

$\frac{\Delta B}{\Delta Z} = -\frac{p_Z}{p_B} = -\frac{3}{3} = -1$

This is a big deal. The slope of the budget line describes the market's rate of substitution between the two goods, and therefore describes the opportunity costs of consuming a bit more of one good (i.e. to get ΔB what you have to give up ΔZ). This is also called the marginal rate of transformation, or **MRT**.

1.2.1 Changes in the Budget Line

In our simple model all we have to deal with are changes in prices and changes in incomes.

→Change in income - just shifts the budget line in or out.

Example: Let the income increase from \$24 to \$36. How does this impact the budget line?

→Change in prices - pivots the budget line.

Example: Let the price of Z, p_z, increase from \$3 to \$12. How does this impact the budget line?

Of course the cause of the change in either of these variables could be from some sort of government policy:

Quantity tax/subsidy

Value tax/subsidy

Lump sum tax/subsidy

1.3 Consumer Optimal Choice

Now we can finally bring together the "best" and the "can afford" sides of our choice problem.

Remember: the consumer's choice problem is pretty simple: consumers choose the best things they can afford.

Operationally this reduces to searching for the bundle in the consumer's budget set that is on the highest indifference curve!

So if you sketch this out it should be clear that this means that at the optimal choice: the budget line and indifference curve are tangent.

Necessary Condition for Consumer's Optimal Choice: indifference curve is tangent to the budget line.

This means:

slope of indifference curve = slope of budget line

price ratio = MRS

For our 2 good example:

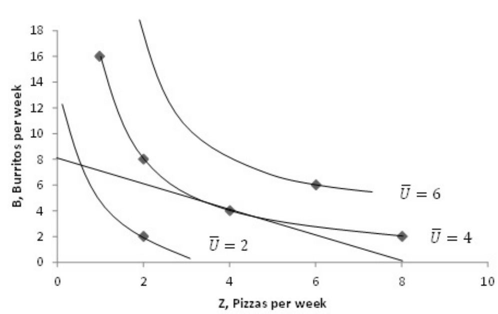
$-\frac{p_Z}{p_B} = MRS_{Z,B} = -\frac{MU_Z}{MU_B}$

$$\begin{aligned} MRS &= \text{price ratio } = MRT \\ \text{individual rate of exchange} &= \text{market rate of exchange} \end{aligned}$$

Sufficient Condition for Consumer's Optimal Choice: consumer's preferences are convex

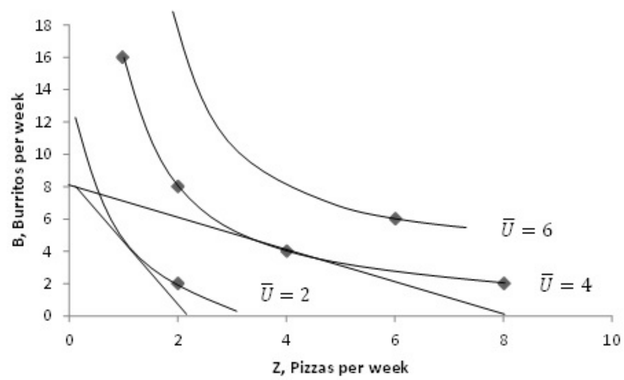
1. Interior solution

Example 1: Let $U(B,Z) = \sqrt{ZB}$, and $p_z = \$3, p_B = \$3, I = \$24$.



Optimal consumer choice

Example 2: Let the price of p_z increase to \$12.



Price increase and optimal consumer choice

2. Corner solution

Discussion Question: How do we evaluate "bads?"

Discussion: Behavioral Economics