# Revealed Preference

Venkata Khandrika

# Outline

# Topic

# Subtopic

# Introduction to Revealed Preference

Until now, we saw how we can use information about the consumer's preferences and budget constraint to determine his or her demand.

Now, we reverse this process and show how we can use information about the consumer's demand to discover information about his or her preferences.

In real life, preferences are not directly observable: we have to discover people's preferences from observing their behavior.

# Assumptions

When we talk of determining people's preferences from observing their behavior, we have to make a few assumptions.

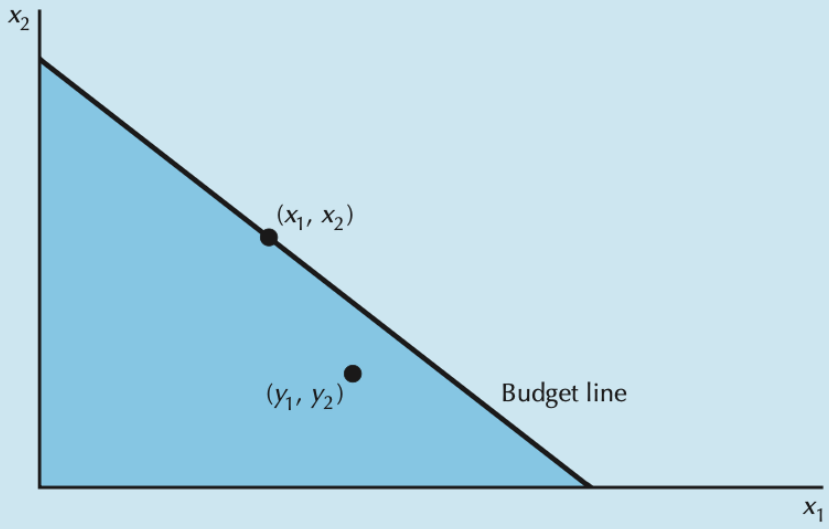
(1) Monotonicity
(2) Strict Convexity
(3) Unchanging Preferences over Short Run

# Subtopic

1. Revealed Preference
   - Idea of Revealed Preference
   - Direct Revealed Preference
   - Principle of Revealed Preference
   - Indirect Revealed Preference
   - Recovering Preferences

# Direct Revealed Preference

Consider the following figure, where the consumer's demanded bundle $(x_1, x_2)$, and another arbitrary bundle, $(y_1, y_2)$, that is beneath the consumer's budget line, are shown.




**Revealed preference.** The bundle $(x_1, x_2)$ that the consumer chooses is revealed preferred to the bundle $(y_1, y_2)$, a bundle that he could have chosen.

# Direct Revealed Preference

Since $(x_1, x_2)$ is the optimal bundle, it must be better than anything else that the consumer could afford. Hence, in particular it must be better than $(y_1, y_2)$.

The same argument holds for any bundle on or underneath the budget line other than the demanded bundle. Since it could have been bought at the given budget but wasn't, then what was bought must be better.

Here, we say that $(x_1, x_2)$ is 'Directly Revealed Preferred' (DRP) to any other bundle which is affordable.

Thus, revealed preference is a *relation* that holds between the bundle that is actually demanded and the bundles that could have been demanded.

# Subtopic

1. Revealed Preference
   - Idea of Revealed Preference
   - Direct Revealed Preference
   - Principle of Revealed Preference
   - Indirect Revealed Preference
   - Recovering Preferences

# Principle of Revealed Preference

Let $(x_1, x_2)$ be the chosen bundle when prices are $(p_1, p_2)$, and let $(y_1, y_2)$ be some other bundle such that $p_1x_1 + p_2x_2 \geq p_1y_1 + p_2y_2$. Then if the consumer is choosing the most preferred bundle she can afford, we must have $(x_1, x_2) \succ (y_1, y_2)$.

# Revealed Preference vs. Preference

Revealed preferred means that "X was chosen when Y was affordable."

Preference means that "the consumer ranks X ahead of Y."

If the consumer chooses the best bundles she can afford, then "revealed preference" implies "preference." Otherwise, they are two different things.

Think of it like this; first, we have the relation $X\ DRP\ Y$. This tells us that $X$ is directly revealed preferred to $Y$. Now, if we make the assumption that the consumer is rational and maximising utility, then we can conclude that $X \succ Y$.

# Subtopic

1. Revealed Preference
   - Idea of Revealed Preference
   - Direct Revealed Preference
   - Principle of Revealed Preference
   - Indirect Revealed Preference
   - Recovering Preferences

# Indirect Revealed Preference

Now suppose that we happen to know that $(y_1, y_2)$ is a demanded bundle at prices $(q_1, q_2)$ and that $(y_1, y_2)$ is itself revealed preferred to some other bundle $(z_1, z_2)$. That is,

$$q_1 y_1 + q_2 y_2 \geq q_1 z_1 + q_2 z_2.$$

Then, we know that $(x_1, x_2) \succ (y_1, y_2)$ and $(y_1, y_2) \succ (z_1, z_2)$. By transitivity of preferences, we can conclude that $(x_1, x_2) \succ (z_1, z_2)$.

It is natural to say that $(x_1, x_2)$ is 'Indirectly Revealed Preferred' to $(z_1, z_2)$.

# Subtopic

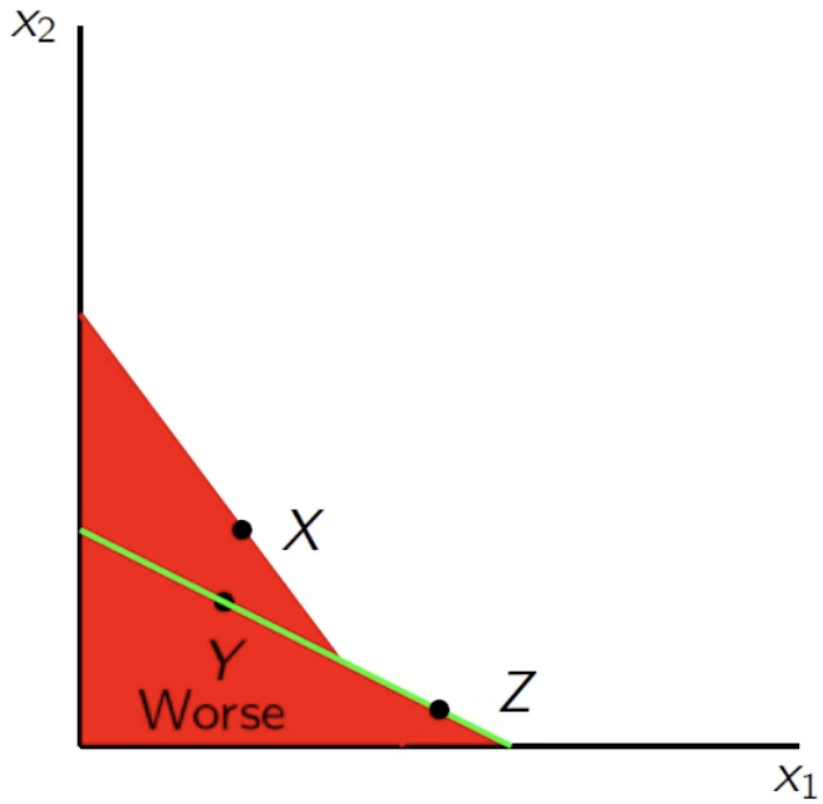
1. Revealed Preference
   - Idea of Revealed Preference
   - Direct Revealed Preference
   - Principle of Revealed Preference
   - Indirect Revealed Preference
   - Recovering Preferences

# Recovering Preferences

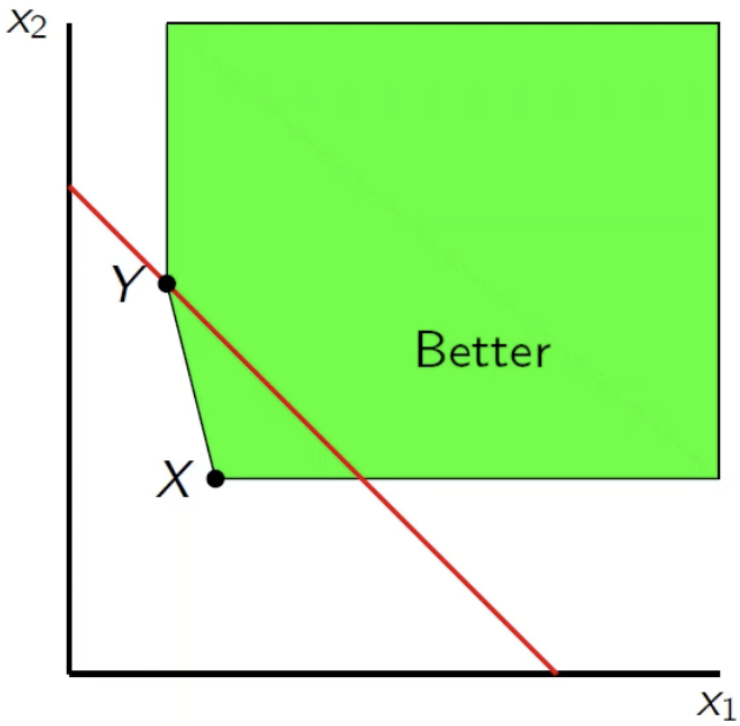
By observing choices made by the consumer, we can learn about his or her preferences. As we observe more and more choices, we can get a better and better estimate of what the consumer's preferences are like.

# Worse Bundles

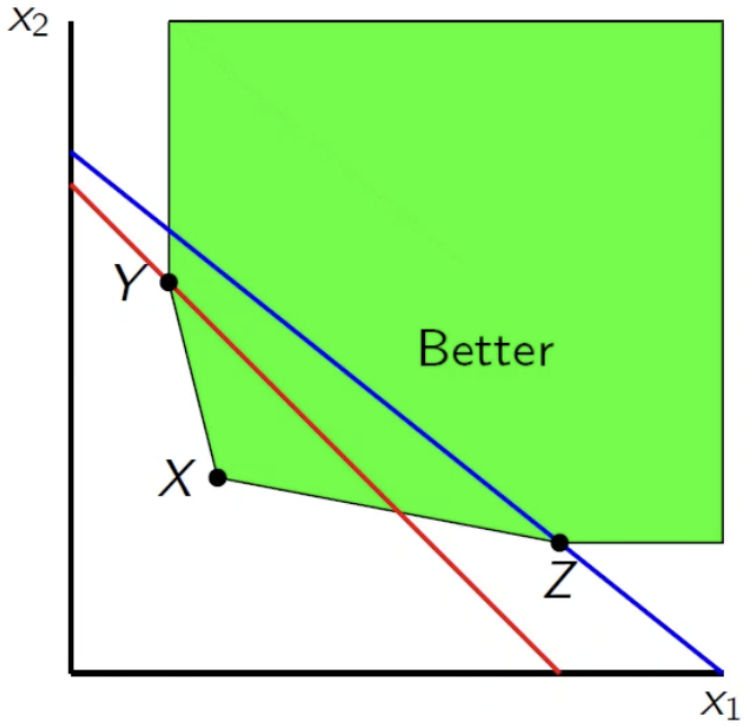
If $X = (x_1, x_2)$ is my demanded bundle, then I can say that it is better than the bundles $Y = (y_1, y_2)$ and $Z = (z_1, z_2)$.



# Better Bundles

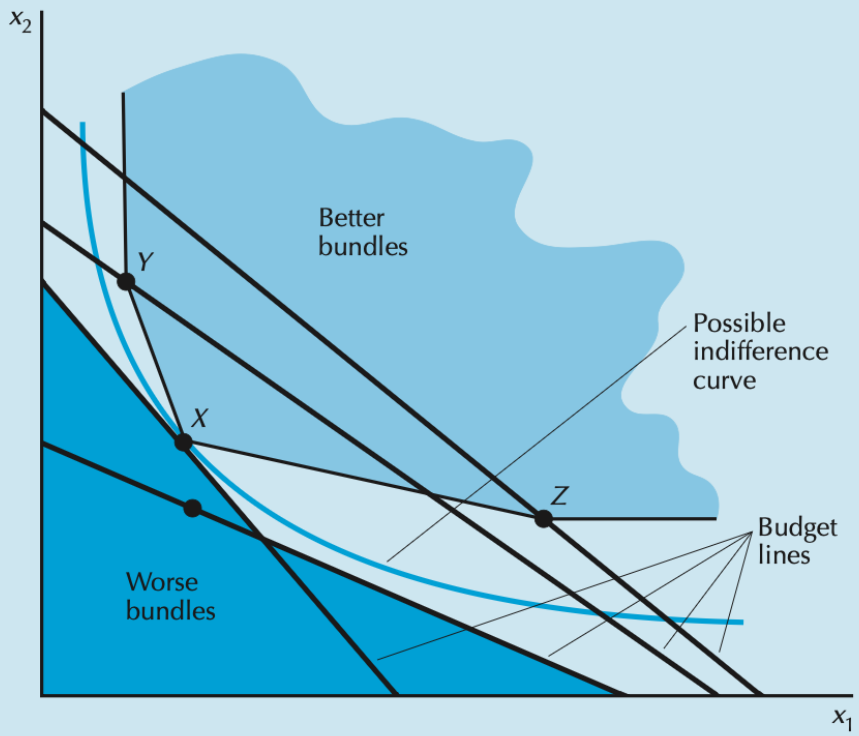



In period 1, we observe a new budget line causing the preferred bundle to be Y.




In period 2, we observe yet another new budget line causing the preferred bundle to be Z.

# Recovering Preferences




**Trapping the indifference curve.** The upper shaded area consists of bundles preferred to $X$, and the lower shaded area consists of bundles revealed worse than $X$. The indifference curve through $X$ must lie somewhere in the region between the two shaded areas.

# Topic

# Subtopic

2. Weak Axiom of Revealed Preference (WARP)
   - Weak Axiom of Revealed Preference (WARP)

# WARP

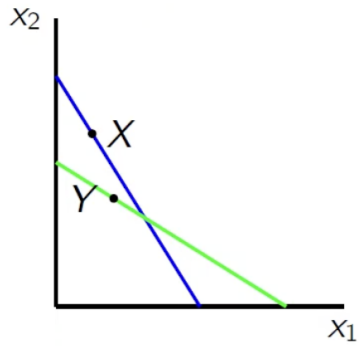
**Axiom**

If $(x_1, x_2)$ is directly revealed preferred to $(y_1, y_2)$, and the two bundles are not the same, then $(y_1, y_2)$ cannot be directly revealed preferred to $(x_1, x_2)$.

Since *DRP* is a relation, it is much more helpful to think about it like this: if $x$ is greater than $y$ $(x > y)$ and $x$ is not equal to $y$ $(x \neq y)$, then $y$ cannot be greater than $x$ $(x \not< y)$.

# Choices Consistent with WARP I

Suppose that the blue budget line is the initial budget line, and the consumer chooses the bundle $X$ on it. Then, the budget line shifts to the green one, and the consumer chooses bundle $Y$.

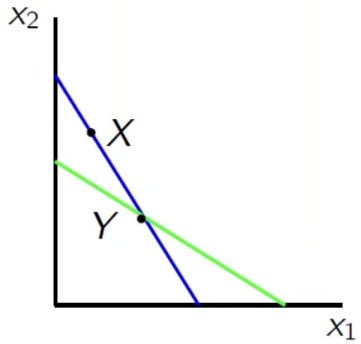



This choice is consistent with WARP. Why?

Initially, $Y$ is affordable, but the consumer chooses $X$. So, $X$ is directly revealed preferred to $Y$. After the budget line shifts, $X$ is no longer affordable, so $Y$ cannot be directly revealed preferred to $X$.

# Choices Consistent with WARP II

Suppose that the blue budget line is the initial budget line, and the consumer chooses the bundle $X$ on it. Then, the budget line shifts to the green one, and the consumer chooses bundle $Y$.

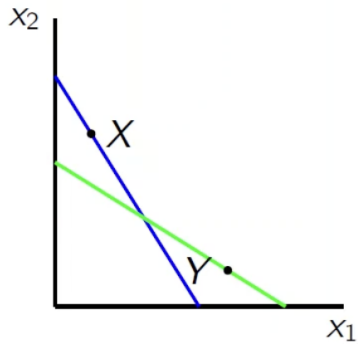



This choice is consistent with WARP. Why?

Initially, $Y$ is affordable, but the consumer chooses $X$. So, $X$ is directly revealed preferred to $Y$. After the budget line shifts, $X$ is no longer affordable, so $Y$ cannot be directly revealed preferred to $X$.

# Choices Consistent with WARP III

Suppose that the blue budget line is the initial budget line, and the consumer chooses the bundle $X$ on it. Then, the budget line shifts to the green one, and the consumer chooses bundle $Y$.

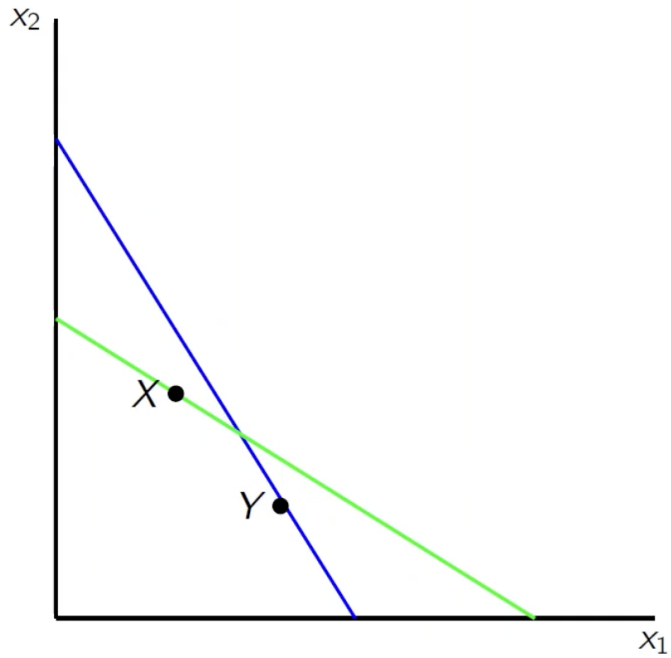



This choice is consistent with WARP. Why?

Initially, $Y$ is not affordable. So, $X$ cannot be directly revealed preferred to $Y$. After the budget line shifts, $X$ is no longer affordable, so $Y$ cannot be directly revealed preferred to $X$.

# Choices Inconsistent with WARP

Suppose that the blue budget line is the initial budget line, and the consumer chooses the bundle $X$ on it. Then, the budget line shifts to the green one, and the consumer chooses bundle $Y$.




This choice is **inconsistent** with WARP. Why?

# Choices Inconsistent with WARP

Recall that WARP states that if $X$ is directly revealed preferred to $Y$, and the two bundles are not the same, then $Y$ cannot be directly revealed preferred to $X$.

Initially, $Y$ is affordable, but the consumer chooses $X$. So, $X$ is directly revealed preferred to $Y$.

After the budget line shifts, $X$ is still affordable, and $Y$ is chosen, hence $Y$ is directly revealed preferred to $X$.

This violates WARP.

# Topic

# Strong Axiom of Revealed Preference (SARP)

## Axiom

If $(x_1, x_2)$ is directly or indirectly revealed preferred to $(y_1, y_2)$, and the two bundles are not the same, then $(y_1, y_2)$ cannot be directly or indirectly revealed preferred to $(x_1, x_2)$.

# Topic

# Subtopic

4. Price and Quantity Indices
   - Quantity Indices
   - Price Indices

# Quantity Index

A quantity index measures how the "average" quantity of goods consumed changes over time.

There are two commonly used quantity indices:

1. Laspeyres Quantity Index
2. Paasche Quantity Index

# Laspeyres Quantity Index

## Definition

A **Laspeyres Quantity Index** uses base period prices for computing cost of choices in both base and subsequent years.

Let $b$ stand for the base period, and let $t$ be some other time. Assume that there are only two goods. How does "average" consumption in year $t$ compare to consumption in the base period?

Suppose that at time $t$ the prices are $(p_1^t, p_2^t)$ and the consumer chooses $(x_1^t, x_2^t)$. In the base period $b$ the prices are $(p_1^b, p_2^b)$ and the consumer chooses $(x_1^b, x_2^b)$. Then, the Laspeyres Quantity Index is:

$$L_q = \frac{p_1^b x_1^t + p_2^b x_2^t}{p_1^b x_1^b + p_2^b x_2^b}$$

# Paasche Quantity Index

## Definition

A **Paasche Quantity Index** uses subsequent period prices for computing cost of choices in both base and subsequent years.

Let $b$ stand for the base period, and let $t$ be some other time. Assume that there are only two goods. How does "average" consumption in year $t$ compare to consumption in the base period?

Suppose that at time $t$ the prices are $(p_1^t, p_2^t)$ and the consumer chooses $(x_1^t, x_2^t)$. In the base period $b$ the prices are $(p_1^b, p_2^b)$ and the consumer chooses $(x_1^b, x_2^b)$. Then, the Paasche Quantity Index is:

$$P_q = \frac{p_1^t x_1^t + p_2^t x_2^t}{p_1^t x_1^b + p_2^t x_2^b}$$

# Subtopic

4. Price and Quantity Indices
   - Quantity Indices
   - Price Indices

# Price Index

A price index measures how the cost of buying a fixed bundle changes over time.

There are two commonly used price indices:

1. Laspeyres Price Index
2. Paasche Price Index

# Laspeyres Price Index

## Definition

A **Laspeyres Price Index** compares the cost of a base period bundle in both base and subsequent years.

Let $b$ stand for the base period, and let $t$ be some other time. Assume that there are only two goods. How does "average" price in year $t$ compare to price in the base period?

Suppose that at time $t$ the prices are $(p_1^t, p_2^t)$ and the consumer chooses $(x_1^t, x_2^t)$. In the base period $b$ the prices are $(p_1^b, p_2^b)$ and the consumer chooses $(x_1^b, x_2^b)$. Then, the Laspeyres Price Index is:

$$L_p = \frac{p_1^t x_1^b + p_2^t x_2^b}{p_1^b x_1^b + p_2^b x_2^b}$$

# Paasche Price Index

## Definition

A **Paasche Price Index** compares the cost of a subsequent period bundle in both base and subsequent years.

Let $b$ stand for the base period, and let $t$ be some other time. Assume that there are only two goods. How does "average" price in year $t$ compare to price in the base period?

Suppose that at time $t$ the prices are $(p_1^t, p_2^t)$ and the consumer chooses $(x_1^t, x_2^t)$. In the base period $b$ the prices are $(p_1^b, p_2^b)$ and the consumer chooses $(x_1^b, x_2^b)$. Then, the Paasche Price Index is:

$$P_p = \frac{p_1^t x_1^t + p_2^t x_2^t}{p_1^b x_1^t + p_2^b x_2^t}$$

# Consumer Price Index (CPI)

**Definition**

A measure of the cost of living. In any period, it measures the cost in that period of a standard basket of goods and services relative to the cost of the same basket of goods and services in a fixed year, called the base year.

The CPI is a Laspeyres Price Index. It is calculated as:

$$\text{CPI}_t = \frac{\text{Cost of base-period basket in current year}}{\text{Cost of base-period basket in base year}}$$

# Topic

# References

Varian, H. R. (2014). Intermediate Microeconomics: A Modern Approach (9th ed.). W. W. Norton & Company.