Demand
Consumer Demand

Consumer’s demand functions:

\[ x_1 = x_1(p_1, p_2, m) \]

\[ x_2 = x_2(p_1, p_2, m) \]
Changes in Income Given Prices
Normal Goods

- Both goods 1 and 2 are normal

\[
\frac{\partial x_1(p_1, p_2, m)}{\partial m} > 0 \\
\frac{\partial x_2(p_1, p_2, m)}{\partial m} > 0
\]
An Inferior Good

- Good 1 is normal.
- Good 2 is inferior:

\[\frac{\partial x_2(p_1, p_2, m)}{\partial m} < 0\]
Income Offer and Engel Curves

Income Offer Curve

Engel Curve

\[ x_2 \]  \[ x_1 \]

\[ m \]  \[ x_1 \]
Cobb-Douglas

- Demand function for good 1:
  \[ x_1 = c \frac{m}{p_1} \]

- Demand function for good 2:
  \[ x_2 = (1 - c) \frac{m}{p_2} \]
Cobb Douglas

Income Offer Curve:  

Engel Curve:
Perfect Substitutes

- Demand function for good 1:

\[ x_1 = \frac{m}{p_1} \quad \text{if } p_1 < p_2 \]

\[ x_1 = 0 \quad \text{if } p_1 > p_2 \]

\[ x_1 = (0, m / p_1) \quad \text{if } p_1 = p_2 \]
Perfect Substitutes (with $p_1 < p_2$)

Income Offer Curve:  

Engel Curve:  

\[ p_1 \]
Perfect Complements

- Optimal choice: $x_2 = x_1$

- Budget line:
  \[ p_1 x_1 + p_2 x_2 = m \]

- Demand function for goods 1 and 2:
  \[ x_1 = x_2 = \frac{m}{p_1 + p_2} \]
Perfect Complements

Income Offer Curve:  

Engel Curve:  

\[
\begin{align*}
\text{Income Offer Curve:} & \quad \text{Engel Curve:} \\
\end{align*}
\]
Homothetic Preferences

- Consumer’s preferences only depend on the ratio of the two goods:
  
  If \((x_1, x_2) \sim (y_1, y_2)\)

  Then, for \(t > 0\)

  \((tx_1, tx_2) \sim (ty_1, ty_2)\)

- Example: Cobb-Douglas, Perfect substitutes, Perfect Complements.

- Properties: straight income offer curve and Engel curve.
Luxury Good
Necessary Good
Changes in Prices

- Fix income and price of one good and change price of the other.
Ordinary Goods

- Price of good 1 decreases.
- Demand for good 1 increases.
Price of good 1 decreases.
Demand for good 1 decreases.
Price Offer and Demand Curves

Price Offer Curve: Demand Curve:
Perfect Complements

Price Offer Curve: Demand Curve:

\[ x_2 \]

\[ x_1 \]

\[ p_1 \]
Substitutes

| Good 1 is a substitute for good 2 when: |

\[
\frac{\partial x_1}{\partial p_2}(p_1, p_2, m) > 0
\]
Complements

- Good 1 is a complement to good 2:

\[
\frac{\partial x_1(p_1, p_2, m)}{\partial p_2} < 0
\]
Inverse Demand Function

- Consider a demand function

\[ x_1 = x_1(p_1, p_2, m) \]

- The inverse demand function is

\[ p_1 = p_1(x_1) \]

Cobb-Douglas example:

\[ x_1 = c \frac{m}{p_1} \]

\[ p_1 = c \frac{m}{x_1} \]
Inverse Demand Curve

- Optimal choice:
  \[
  \frac{p_1}{p_2} = -MRS
  \]

- Suppose: \( p_2 = 1 \)
  (composite good)

- Rearrange:
  \[ p_1 = -MRS \]