1 Axioms of choice

We use the axioms to derive indifference curves.

- More is better than less.
- Completeness
- Transitivity

2 Utility function

$$U(F, C)$$

- U is increasing in F and $\dot{C}$.
- $U_F\ (F, C)$ is the increase in utility due to a marginal increase in F.
- $U_C(F, C)$ is the increase in utility due to a marginal increase in C.

3 Marginal rate of substitution

How do we measure the tradeoff between food and clothing along an indifference curve?

- Consider an consumer with C units of clothing and F units of F. Let her have Δ_F more marginal units of food and Δ_C more marginal units of clothing.

- What is her increase in utility when she has Δ_F more food?

$$U_F \Delta_F$$

- What is her increase in utility from the extra clothing

$$U_C \Delta_C$$

- What is her total change in utility

$$\Delta_U = U_F \Delta_F + U_C \Delta_C$$

- But if she stays on the same indifference curve and her total utility did not change,

$$\begin{aligned} U_F \Delta_F + U_C \Delta_C = \Delta_U &= 0 \\ U_C \Delta_C &= -U_F \Delta_F \\ \frac{\Delta_C}{\Delta_F} &= -\frac{U_F}{U_C} \end{aligned}$$

(MRS) The marginal rate of substitution of food for clothing

$$\frac{U_F}{U_C}$$

is a positive number. It is also the negative of the slope of the indifference curve.

- Diminishing MRS

4 Budget constraint

- P_C is the price of clothing.
- P_F is the price of food.
- I is income of consumer.
- Her budget constraint:

$$P_C C + P_F F \leq I$$

- Slope of budget line:

$$C = \frac{I}{P_C} - \frac{P_F}{P_C} F$$

$$-\frac{P_F}{P_C}$$

- How does the budget constraint change when I increases?

- How does the budget constraint change when P_F increases?

- How does the budget constraint change when P_C increases?

5 Consumer optimum

$$\frac{P_F}{P_C} = MRS$$
$$-\frac{P_F}{P_C} = -\frac{U_F}{U_C}$$

- Consumer equates the slope of the indifference curve with the slope of the budget constraint.

- Tangency condition.

- Derive optimum condition. Consider an initial allocation on the budget line $A = \{F, C\}$.

- Increase food consumption by Δ_F marginal units.

- Increase in utility from food is $U_c \Delta_F$.

- Decrease in clothing to buy extra food is $\frac{P_F \Delta_F}{P_C}$.

- So decrease in utility from less cloting is $\frac{P_F \Delta_F}{P_C} U_c$.

- She will want to increase her food consumption by Δ_F if $U_c \Delta_F + \frac{P_F \Delta_F}{P_C} U_c > 0$, decrease it if $U_c \Delta_F + \frac{P_F \Delta_F}{P_C} U_c < 0$. A is optimal if $U_c \Delta_F + \frac{P_F \Delta_F}{P_C} U_c = 0$ which is the optimality condition given above.

6 Application

- Cost of living adjustment.