Problem Set One

EC201

Problem 1. With your own example, explain how one party/agent/firm/consumer's choice set influences the feasibility set of another party/agent/firm/consumer.

Answer – By providing a subsidy for fuel efficient cars, the U.S. government directly influences the feasibility set of the consumer. That is, the government's choice of the subsidy and which types of cars/trucks to apply it to directly affects the set of cars/trucks a consumer can afford.

Problem 2. In class, we noted that the choice set of a consumer is the set of all goods and services that can be purchased in a market. Consider the choice set from the perspective of a firm. What might their choice set be?

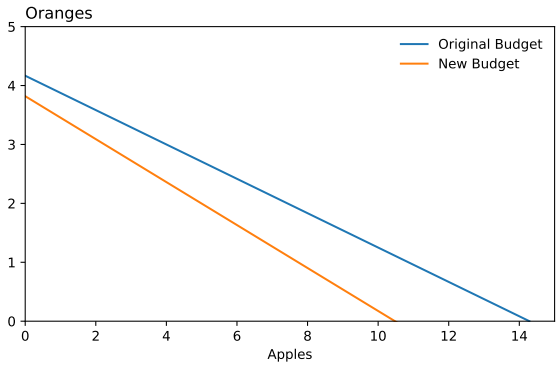
Answer – The choice set of the firm would include actions concerning what to make, how to make it (produce it, ship it, etc), how to advertise it, and the price at which to sell it for – to name a few choices!

Problem 3. As you might have experienced over the past year, the prices of some goods have increased faster than others (and faster than income in some cases). Explain with the help of a graph and math, what effects this would have on a consumer's budget set.

Answer – We would expect the budget line to shift in if prices are rising relatively faster than income and rotate if the ratio of the prices also changes. We can reason through this using the function whose graph is the budget constraint depicted below.

If the ratio of income to price of oranges falls, then the budget set will shift in. If the ratio of the price of apples to the price of oranges increases, then the budget line will steepen.

$$\text{Oranges} = \frac{\text{Income}}{p_{\text{oranges}}} - \frac{p_{\text{apples}}}{p_{\text{oranges}}}\text{apples}$$



Problem 4. In class, we defined the consumer's budget set with respect to two goods so that we could visualize the budget line. We also assumed that the income of the consumer was a parameter of the problem (i.e. something that is fixed and which the consumer has no choice over). We could extend this model, though, to capture the fact that income is actually something individuals choose. Please write down such a model.

- What is the choice set of the consumer?
- What is the constraint function of the consumer? How might this constraint function be parameterized?
- What is the feasibility set of the consumer?
- What is the opportunity cost of leisure in this model?

Answer

- Keeping within the same toy set-up of considering onto two goods, the choice set would now expand to include leisure as the third good. That is, consumers would select bundles which would be elements in the following set

$$\mathbb{R}_+ \times \mathbb{R}_+ \times [0, 24]$$

  Where the interval $[0, 24]$ denotes the amount of leisure someone can choose.

- The constraint function could be expressed as follows

$$\mathbb{F} : \mathbb{R}_+ \times \mathbb{R}_+ \times [0, 24] \to \{0, 1\}$$

$$F_{p,w}(x_1, x_2, l) = x_1 p_1 + x_2 p_2 > (24 - l)w$$

  Where we have parameterized the constraint function by a vector of prices and the hourly wage, denoted by w.

- We know that mathematically we can express the feasibility set as the preimage of 0 under the constraint function

$$\text{Feasibility Set} = F^{-1}(0)$$

  More intuitively, though, the feasibility set is defined as the collection of combinations of goods purchased and leisure taken such that the consumer can afford to purchase the goods given the hours they choose to work.

- The opportunity cost of leisure in this model is the forgone hourly wage. We can also express this in terms of the other goods by dividing the wage by the corresponding price

Problem 5. In class, we explained that we could represent the price of n goods and services via a vector in $\mathbb{R}^n_+$. In doing so, we assumed that the price of a good or service didn't depend on how much of the product the consumer purchased. In some cases, though, this assumption is violated as when the producer will discount the price as the quantity purchased of the good increases.

To be specific, let's assume that the choice set of the consumer is $\mathbb{R}^2_+$, and that the price of x_2 depends on how much of x_2 the consumer purchases. To the best of your abilities, please derive the budget line. That is, please define the function, f, that maps from X_1 to X_2 such that for any $x_1 \in X_1$ and any value $x_2 > f(x_1)$ the bundle (x_1, x_2) is not feasible.

Answer – We can express the budget constraint as the following implicit function

$$f(x_1) := \underset{x_2}{\text{solve}}\ F(x_1, x_2) = 0$$

$$\text{where} \quad F(x_1, x_2) := p_1 x_1 + p(x_2)x_2 - m$$