Building a Package for Microeconomics

Introduction

In this project, you will apply your knowledge of object-oriented programming in Python to build a package named `microecon`. This package will encompass core concepts of microeconomics, including preferences, consumer behavior, Pareto equilibrium, etc. We consider the two-good case and the ultimate goal is to draw an Edgeworth box in the case of two consumers.

Package Structure

Your `microecon` package will consist of three modules: `preferences`, `consumer`, and `edgeworth`. Below is a description of what each module should contain:

`preferences` module

- **Abstract Class** `Preferences`: This class should declare the abstract methods `utility(self, x, y)` and `indifference_curve(self, utility_level)`. Implement a method `mrs(self, x, y)` to calculate the marginal rate of substitution.
- **Concrete Classes**: Implement concrete classes `CobbDouglas` and `CES` (for Constant Elasticity of Substitution) that inherit from `Preferences` and define the aforementioned abstract methods.

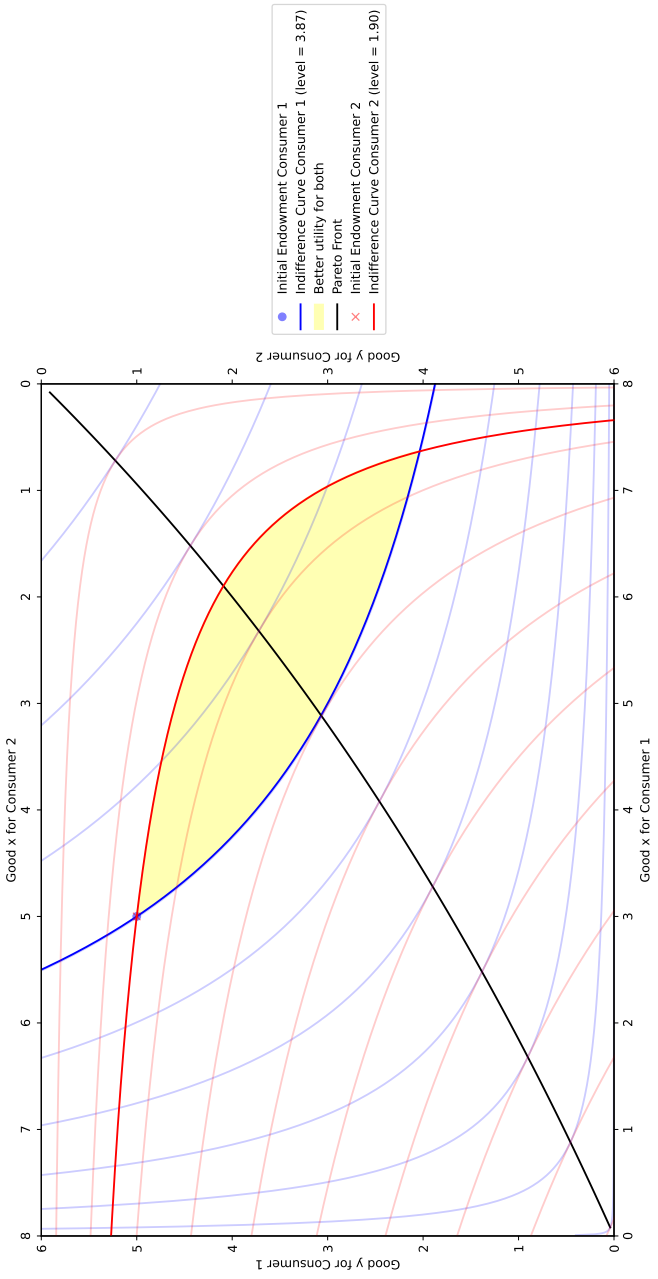
`consumer` module

- **Class** `Consumer`: Define a basic consumer class with attributes for preferences (an instance of a `Preferences` subclass) and initial endowments.
- **Class** `CobbDouglasConsumer`: A subclass of `Consumer` that specifically uses the `CobbDouglas` preference. Ensure it appropriately initializes its parent class.

`edgeworth` module

- Implement the functionalities required to generate an Edgeworth box for any two consumers. This will likely include a class to represent the box itself and methods to plot the box, illustrate indifference curves for both consumers, and identify Pareto optimal allocations.

At the end of the sessions, you should be able to draw an Edgeworth box like the one that follows:


Initial Endowment Consumer 1
Indifference Curve Consumer 1 (level = 3.87)
Better utility for both
Pareto Front
Initial Endowment Consumer 2
Indifference Curve Consumer 2 (level = 1.90)
Good x for Consumer 2
Good y for Consumer 2
Good x for Consumer 1
Good y for Consumer 1