Class 4, Problem Set 2

Introduction to Programming and Numerical Analysis

Plan for today

1. Inaugural project
    - We will work on it next tuesday
    - Deadline March 21, 2021
2. Let's GIT it out of the way
    - Questionnaire
3. Work on PS2

The problem

Choose optimal housing and consumption:

$$c^*, h^* = \arg\max c^{(1-\phi)} h^{\phi}$$

$$s.t.$$

$$\tilde{p}_h = p_h \epsilon$$

$$m = \tau(p_h, \tilde{p}_h) + c$$

$$\tau(p_h, \tilde{p}_h) = r p_h + \tau^g \tilde{p}_h + \tau^p \max\left(\tilde{p}_h - \bar{p}, 0\right)$$

Utility is given by:

$$u = c^{(1-\phi)} h^{\phi}$$

Implement in python:

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$$u = c^{(1-\phi)}h^{\phi}$$

Implement in python:

In [2]:

```python
# Exogenous variables as global variables
phi = 0.5

def utility_function(c, h, phi):
    return (c**(1-phi))*(h**phi)

# With dictionary of exogenous variables
param_dict = {'phi' : 0.5
             ,'parameter' : 1.5 # and so on
             }

def utility_function(c, h, param_dict):
    return (c**(1-param_dict['phi']))*(h**param_dict['phi'])
```

What about the constraints?

Do the same!

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What about the constraints?

Do the same!

In [5]:

```
def cost_of_housing(arguments, param_dict,r, tau_g): # Eq. (4)
    return param_dict['r']*p + param_dict['tau_g']*p_tilde #... and so on
```

How is the model solved?

As consumption, c is implictly given by the constraints you only need the optimizer to find the optimal amount of housing, h.

This implies that your objective function calculates c given the constraints and returns the (negative) utility

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In [4]:
```
def value_of_choice(arguments, param_dict):
    # Calculate the choice of consumption using the constraints and the functions you have c
    # Hint: Use constraints to implicitly find the choice of consumption, c
    return -utility_function(h,choice of consumption goes here,param_dict) # '-' because we
```

Write a function that optimize

How is it done? - recall PS1/Lecture 3

- Create objective funtion
- Initial guess
- Call optimizer: optimize.minimize() or optimize.minimize_scalar()
- Create a print condition that prints out the results
- If you want return the values as well

Questions?

What's up with GitHub?

Let's try to resolve all the issues today

Please fill out the questionnaire

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Pulling using VSCode

1. Important: always have a working folder and a folder that you pull changes to!
2. Click on 'Open folder' in the 'Welcome'-tab and open the local repository
3. (a) Press `control/command + shift + p` and enter `Git: Pull`
4. (b) Alternative: Press `Synchronize Changes` in the bottom left
5. Your folder is now up to date

Pulling using Terminal/Prompt

1. Important: always have a working folder and a folder that you pull changes to!
2. Open Terminal/Prompt
3. Change directory to the Git folder by entering `cd User/Desktop/Git_folder`
4. Enter `git pull`
5. Your folder is now up to date

Getting help

- Go into the main meeting and tell me to join your channel
- If im not there, leave a @Victor comment in the main meeting such that i get a notification

Working on PS2

Focus on

- 2.3 (interactive figure)
- 2.5 (creating modules)
- 2.6 (git)
- 3 (exchange economy)

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